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VIEWS, NEWS AND INTERVIEWS.

Mr. John W. Mackay, of the Postal Telegraph-Cable Company, is erecting a large and elaborate mausoleum in Greenwood Cemetery, Brooklyn, N. Y. The interior resembles a chapel. Electricity is to be used for lighting and heating. About 50 incandescent lamps will be ranged along an angle of the cornice in such a manner that they will be hidden from sight, but will flood the interior of the mausoleum with a soft, diffused light. Electrotherms will be placed either below registers in the floor or behind fans in the corners.

The Prince of Wales, accompanied by an equerry, recently rode through the streets of London in an electric cab.

The newspapers stated last week that Prof. Graham Bell, father of Prof. Alexander Graham Bell, would marry Mrs. Shibley in New York city in January. A Canadian paper says that Mr. Bell had occasion some time ago to be in Perth, where he was interested in a little girl, to whom his wife at her death had willed some money. While there he saw a photograph of Mrs. Shibley, widow of the late John Shibley, of Harrowsmith. He was most favorably impressed, and remarked that if the original was not married he would wed her himself. He was informed that she was a widow, and he requested the pleasure of meeting her. This was satisfactorily arranged, and the outcome was an engagement.

A telephonic connection has recently been opened between Venice and Treviso. The Italian Minister for Post and Telegraphs on that occasion stated that he would do all in his power to bring about the establishment of state telephones in Italy, and he hoped the finances of the country would soon allow of the plan being realized.

The recent foggy weather in London has caused an Englishman to make a very sensible suggestion to the effect that during these dark days and darker nights the police on "crossing" duty should be equipped with electric lamps on the tops of the helmets. We know on excellent authority, says London *Lighting*, that "a policeman's life is not a happy one," and no one who has seen the apparently hairbreadth escapes which the street constable experiences every few minutes of his harassing turn of duty would willingly change places with him. It is marvelous that there are so few accidents, and the comparative immunity of the force from damage to life and limb reflects the greatest credit on their own coolness and courage, as well as on the discipline and good feeling of the London drivers. Still, the immunity is only comparative, and hospital and station records could tell a long tale of policemen maimed in the execution of their duty.

The Brooklyn, N. Y., Aldermen have adopted an ordinance compelling the trolley companies to provide cars for the accommodation of smokers. Not less than one in every three cars must be a smoker between 5 A. M. and 9 A. M., and 5 P. M. and 7 P. M., and during the remainder of the day the average is to be one to five.

Acetylene can be neither manufactured nor sold in Great Britain now save by express permission of the Home Secretary, the prohibition being made in a recent order in council.

News from Owensboro, Ky., is to the effect that Mrs. Maggie Brandon called at the central telephone office one afternoon recently and cowhided an operator for alleged disclosure of her conversation over the wire.

One of the longest telephone lines in the world will be completed within 10 days. Connections will then be opened between Seattle, Wash., and San Diego, Cal., a distance of 1,700 miles. Workmen are now constructing the line between Eugene and Redding, Cal., which is the only gap in the system. Manager Hopkins says the line will be longer than the Boston & Omaha line by 70 or 80 miles. Connections will be made to Spokane and to the British Columbia mining camps on the Kootenay river.

Fig. 1.—The Lady Ready for Electrocution.

"Gone," An Optical-Electrical Illusion.*

This clever illusion was designed by Mr. W. E. Robinson, the assistant of the late Herrmann the Great. It has been exhibited in several of the large cities, and is always a great success. When the curtain is raised the square frame is seen; this frame is braced laterally by side pieces. At the lower part of the frame, within easy reach of the prestidigitateur, is a windlass. Ropes pass from this windlass, over pulleys, to a cross-bar in the upper part of the frame. A lady is now brought upon the stage, and for some terrible crime is sentenced to be electrocuted. She is seated in a chair, which she grasps tightly. She is then tied tightly to the chair with ropes, and her hands are chained together. The prestidigitateur now secures the chair, with its fair occupant, to the ropes which are connected with the windlass, by means of hooks which fasten to the top frame of the chair. Wires are now secured to the unfortunate lady, so that it really seems as though she was to receive the death-dealing current. The professor of magic now winds away at the windlass and raises the chair until the head of the victim is on a level with the cross-bar. He then discharges a pistol, and at the same instant the lady disappears and the chair drops to the floor. Such is, in brief, the mode of operation of the trick called "Gone."

In reality the illusion is a clever adaptation of the "Pepper Ghost." A reference to Fig. 1 will show at the sides of the frame a row of incandescent lights. While the lady is being secured to the chair, and while she is being hoisted up to the cross-bar, these lamps are kept lighted; but the instant the pistol is fired, these lights are extinguished by a stage hand in the side scene. Up over the proscenium arch is arranged a background which corresponds to the background of the stage. Two wooden bars cross it. Directly below this screen, and care-

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fully shielded from the observation of the spectators, is a row of incandescent lights. As the pistol is fired these lights are turned on, while those in the frame are extinguished. Now, according to the principles of the "Pepper Ghost," the person or thing which is brilliantly lighted has its image projected on a sheet of glass and appears to be real. The front of the frame, from the windlass to the horizontal cross-piece, is covered with a sheet of glass which is not apparent to the audience.

The image of the background is projected upon this glass, which hides the lady from view, although she is immediately behind it, and the pieces of wood and this artificial background take the place of the back posts of the frame, thus deceiving the audience. The chair is made in two sections, the lady being tied to the upper or skeleton chair. She holds a heavy chair with her hand tightly, and at the instant when the pistol is fired she releases the chair, which falls to the floor with a loud noise.

There is another illusion, called "Out of Sight," invented also by Mr. W. E. Robinson, which is somewhat similar, but is not as interesting from a scientific point of view. It is, however, better adapted for a traveling company, as there is no glass to break, the large sheet of plate-glass in the front of the frame being entirely dispensed with. When the pistol is fired a curtain of the same color as the background is released by the prestidigitateur, and it is drawn down quickly by means of rubber bands. It takes only an instant for the curtain to descend, its lower edge being hidden from view by the windlass. The audience is usually deceived as easily by this illusion as by the more complicated one.

A Habirshaw Christmas Festival.

The India Rubber and Gutta Percha Insulating Company has invited its customers to a patriotic (Red, White and Blue core) Christmas celebration at its offices, 15 Cortlandt street, New York city, on Friday afternoon, December 31, from one to six o'clock. The hosts of the occasion will be Messrs. Wm. M. Habirshaw, general manager; J. W. Godfrey, sales manager; F. W. Harrington and J. B. Olson. It is understood that horseless carriages may be ordered for six o'clock.

American Stoker Company.

The American Stoker Company, of Brooklyn, N. Y., was incorporated on December 17, with a capital of $500,000, to purchase the franchises of the American Stoker Company, of Dayton, Ohio, and to manufacture stokers and other tools. The directors are Royal C. Peabody, David H. Valentine, Alfred J. Couch, Frank H. Field, Henry Batterman, Hugh W. Fullerton and William S. Barstow, of Brooklyn.

Mr. J. Potter, president of the Buckeye Electric Company, of Cleveland, spent last week in New York city, making his headquarters at the Waldorf-Astoria.

THE NEW PLANT OF THE UNITED STATES ELECTRIC LIGHTING COMPANY AT WASHINGTON, D. C.

A MODERN STATION EQUIPPED WITH UP-TO-DATE APPARATUS.

BY GEORGE H. DRAPER.

At the annual meeting of the stockholders of the United States Electric Lighting Company, of Washington, D. C., held in November, 1896, a resolution was passed authorizing the board of directors to employ competent engineers, have plans drawn, and contracts made for the erection of a new and entirely complete modern electric lighting station, to be located on the property of the company at the corner of Fourteenth and B streets, N. W. In pursuance of these instructions, the necessary appropriation having been made, the board of directors secured the services of Messrs. Sargent & Lundy, of Chicago, as electrical and mechanical engineers, who immediately proceeded to make the plans and draw up the numerous contracts. In the early part of this year bids were opened and contracts awarded for engines, dynamos, switchboards and other electrical and mechanical apparatus, together with contracts for a substantial foundation and superstructure.

FIG. 2.—RAISING THE LADY BY MEANS OF THE WINDLASS.—(See page 295.)

The first work begun was the laying of a solid cement foundation, which was made necessary owing to the very swampy condition of the ground in that portion of the city where the plant is located. To this end, and at an expenditure of $24,600, a pile and Portland cement foundation was laid. At a distance of about 10 feet below the street surface, there were driven into the ground, at depths ranging from 20 to 30 feet, 1,600 spruce piles, each 12 inches in diameter, covering an area of 15,000 square feet, over which was placed, three and one-half feet deep, a Portland cement concrete, making a support for the entire superstructure, as well as a solid foundation for the engines and dynamos.

The contract for the superstructure was awarded to Mr. Frank N. Carver, a local builder, whose bid amounted to about $75,000. The building as designed by the architect, Mr. Erskine M. Sunderland, of Washington, D. C., calls for a handsome structure extending the whole length of the block on B street, between Thirteenth and One-half and Fourteenth streets, a distance of about 250 feet, with a depth of 130 feet. Two pavilions, 28 feet square and 64 feet high, occupy the corners, and connecting them is the front of the building, pierced by 13 windows, 9½ feet wide by 25 feet high, affording ample light and making bright and cheerful the large engine-room, 73 feet wide and extending along the entire B street front.

It has been the aim to have the building as fireproof as possible. The floors of the new structure will therefore all be of iron beams, arched with brick, and covered with a cement and stone floor of ornamental design. The roof will consist of iron rafters with cemented terra-cotta book tiles, covered with either a gravel or slag coating. The only woodwork about the building will be the window sashes and outside doors.

Only a little over one-half of the contemplated building will be erected at the present time, as the remainder of the site is now occupied by the station of the company. Upon completion of the new plant early in the coming year the entire service will be transferred to it, as the portion to be built will have a capacity 20 per cent greater than the old station. With the transfer the old station will be gradually dismantled and the new one extended so as to include the present site. The company, however, owns all the surrounding property, and can quadruple, when necessary, the present new plant, affording an output of 500,000 16 candle-power incandescent lamps, or its equivalent in other forms of electrical application.

The boiler-room, which is located just north of the engine-room, and running the entire length of the building, is 46 feet wide, and is at present equipped with three batteries (of two each) of 500 horse-power Babcock & Wilcox water-tube steel-front boilers, of the latest design, delivering steam at a pressure of 160 pounds, and fitted with the Babcock & Wilcox automatic chain grates. Natural draft is used, and before the waste gases of combustion are allowed to escape up the large steel smoke-stack they are obliged to traverse a fuel economizer containing the feed water and affording upward of 10,000 square feet of heating surface, thus heating the feed water from its ordinary temperature to the highest degree possible. This fuel economizer will be the first to be operated in this section, and is furnished by the Fuel Economizer Company, of Matteawan, New York.

At the right of the boiler-room and resting on an extra solid foundation of cement and iron beams is the large brick and steel stack, 200 feet high, with a 12-foot base diameter, and of sufficient capacity for additional boilers, for which foundations are already erected. The steel portion of the stack is furnished by the Variety Iron Works, of Cleveland, Ohio. The boilers will be connected by a ring system of mains, with suitable arrangement of valves, giving almost absolute safety against shut-downs, due to leaks or accidents.

Soft bituminous coal is used, delivered by carts into a crusher and thence conveyed to overhead bins, having a capacity of over 1,000 tons, by coal handling machinery of a very late and improved design furnished by the John A. Mead Company, of New York. The coal is fed and weighed automatically upon the revolving chain grates; the ashes below are conveyed by the coal handling machinery to the ash bins, from which they drop by gravity into carts for hauling away, the coal not being touched by hand from the time of its arrival to the departure of its ashes.

Separated from the boiler-room by a 24-inch brick wall, pierced only by the steam pipes and tightly closing fireproof doors, is the basement of the engine-room. In the basement are all the steam and other piping connections, pumps, etc., as well as a line of jack shafting running almost the entire length of the station, on which are belted the Brush arc machines, mention of which will be made later.

The engine-room equipment consists of four horizontal tandem compound condensing engines, two of 1,600 horse-power and two of 800 horse-power, fitted with jet condensers, each direct connected to two of the General Electric Company's generators. To each of the 800-horse-power engines are direct connected two 240-kilowatt, 160-volt six-pole General Electric generators; to one of the 1,600-horse-power engines are connected two 240-kilowatt, 160-volt six-pole General Electric generators, and to the other 1,600-horse-power engine are connected two 480-kilowatt, 160-volt six-pole General Electric generators, and to both of the large engines is belted the line shafting in the basement.

As will be seen, belting is not altogether dispensed with, as there are eight 125-light multi-circuit Brush arc dynamos operated through runways in the floor from the line shafting located in the basement, which, as before stated, is connected with the two large engines operating the direct-connected low-tension generators, either one of which being capable of carrying the entire load. The arc machines may be thrown in or out of service as required by means of the shafting by steel clutches five feet in diameter. This arrangement economically provides for the operating of both the three-wire low-tension and the arc lighting systems from one engine during the period of light load. The shafting was installed by the Hill Clutch Company, Cleveland, Ohio.

Beside the Brush machines there will be belted to the line shafting two General Electric Company's alternating dynamos, one A-70, 1,040-volt, 125-cycle, and one A-30, 1,040-volt, 125-cycle. Another alternating machine is to be run by motor.

Spanning the engine-room is an electric crane of 25 tons lifting capacity, with a 72-foot span, capable of lifting its load and depositing it in any portion of the room in a few moments.

In order to cut off the high "peak" and more nearly equalize the 24-hours load principally, and incidentally to help out the present plant during the remodeling, the company has purchased and installed a large storage battery from the Electric Storage Battery Company, of Philadelphia, Pa. This battery comprises 150 cells, and has a capacity of 2,000 amperes

on a side for three hours, and is so arranged as to be connected with either or all feeders or the main bus, and thus can always be used to the best advantage. The battery is discharged at from 150 to 135 volts. It is charged at the period of lightest load; *i. e.*, from 1 A. M., to 6 A. M., and from 9 A. M. to 3 P. M., and at very low pressure. At certain periods it will be able, if necessary, to run the entire plant, and will easily carry any unexpected demand, such as darkness, due to a sudden storm or an accident to any portion of the machinery. The battery is located in a large building recently purchased by the company, immediately adjoining its present station.

Installed at the Fourteenth street end, and extending the full width of the engine-room, will be the switchboards operating the entire service of the company, comprising the low-tension three-wire system, arc and alternating systems and the storage battery. The boards are made of blue, Rutland, Vt., marble, highly finished and containing the latest and finest instruments and appliances known to the electrical art.

The low-tension board which is being made by the General Incandescent Arc Light Company, of New York, is composed of 18 panels, five panels at the left end to form the generator board, 11 panels at the right end, the feeder-board, and two panels between the generator and feeder panels, the pressure board. It is to be provided with two sets of bus-bars which can be run at different pressures. On each of the three generator panels controlling six 240-kilowatt, 160-volt generators, are to be mounted two 2,000 ampere ammeters, three 2,000 ampere switches, two balance indicators and two galvanometer switches. On the generator panel to control two 480-kilowatt, 160-volt generators are two 4,000 ampere ammeters, three 4,000 ampere switches, two balance indicators, and two pilot lamps, and the last generator panel is to be left blank for additional 480 kilowatt generators to be installed in the future.

Of the 11 feeder panels eight are to control sixteen 500,000-circular-mil feeders, and on each are mounted four 500-ampere ammeters, four 500-ampere switches and two 250-ampere switches on the neutrals. One feeder panel is to control two 1,000,000-circular-mil feeders, and on it are mounted four 1,000-ampere ammeters and two 1,000-ampere switches on neutrals. Two feeder panels are left blank for two additional 1,000,000-circular-mil feeders each.

On the pressure panel next to the generator board are two voltmeters for pressure regulation, four 24-point voltmeter switches, one 8,000-ampere Thomson recording wattmeter and one 5,500 ampere Thomson recording wattmeter. On the pressure panel next to the feeder board are two 24-point voltmeter switches, one 2,000-ampere neutral ammeter, one 8,000-ampere Thomson recording wattmeter and one 5,500-ampere Thomson recording wattmeter. Switches for voltmeters are wired so that they can be connected with the pressure wires of any feeder or to either bus-bar. The instruments used are from the Weston Electrical Instrument Company, with the exception of the wattmeters.

The alternating s itchboard, constructed by the General Electric Company, consists of seven panels—three for the generator and four for the feeder board. Two panels control two 60-kilowatt, 1,040 volt, 125-cycle alternating-current generators and exciters, and on each are mounted two fuse-blocks, one ammeter, one 150-volt voltmeter, one ground detector, one ground detector lamp, one ground detector switch, one double-throw, direct-potential generator switch, one double-pole switch for exciter and one Thomson recording wattmeter. Two feeder panels control four feeders, and on each are mounted four 50-ampere fuse-blocks, two 50-ampere, double-pole, direct-potential switches, and on the back of these panels are four 1,000 volt station lightning arresters. Two feeder panels are left blank. Carpenter rheostats are used on all of the boards excepting the arc, and are placed in the rear under the floor, being controlled by gearing with hand wheels on spindles.

The arc switchboard is composed of 11 panels and is divided into three sections of three panels each, and between the sections are two smaller panels which are used in transferring the machines of one section to another. The board is made for 16 Brush arc machines, but at present only 32 circuits will be used from eight arc machines, four circuits to each dynamo.

In addition to the switchboards mentioned there is to be placed alongside of them the storage battery switchboard. This is to be made of the same material as the others and is composed of practically but one horizontal panel, but this is divided into two parts. On this are mounted instruments to control four 20-point cell-regulating switches, two on each side of the system, each capable of carrying 1,000 amperes. These switches are located in the storage battery room and are provided with motors and indicators to enable them to be operated from the board. There are also mounted upon it six single-pole knife switches of 1,000 amperes each, four Weston illuminated dial ammeters, two Weston illuminated dial voltmeters, two special Weston low-reading round-pattern voltmeters and two 20-point voltmeter switches.

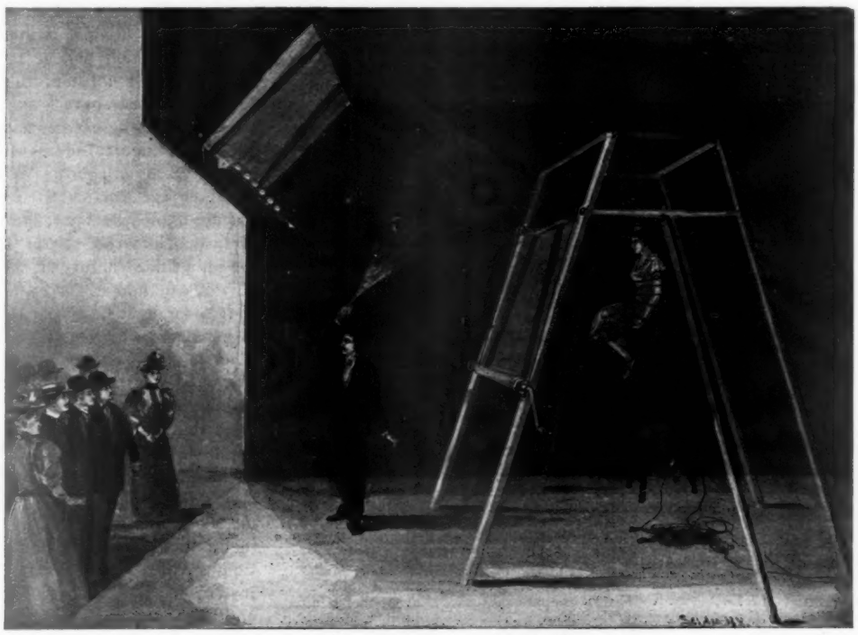


FIG. 3.—THE ILLUSION OF "GONE" EXPLAINED.—(See page 295.)

These switchboards are 90 inches high, with a nickel-plated fancy top. All metal, except current-carrying copper showing on the face of the boards, will be nickel-plated. The boards are securely mounted on substantial steel frames, fastened to the floor framing and to the wall. Cable connections to them are made by passing the cables through the floor from the back of the boards along the ceiling of the basement and up through the floor again to the generators and to the battery.

In connection to the new plant and vital to its successful operation is the underground cable system, which is almost entirely used here, but few overhead mains existing.

Additional overhead wires, except services to residences adjacent to existing wires, are absolutely prohibited in the District of Columbia by an act of Congress, as has also been the laying of additional conduits. With the above, and a few other exceptions granted the United States Electric Lighting Company, no additional conduits can be laid, except by direct act of Congress, but this does not prohibit the repairing of existing conduits. The United States Electric Lighting Company was one of the original pioneer companies in this country to make use of an underground system, and owing to lack of experience some of their first laid conduits are now in poor shape, and often it is found that the duct capacity is too small for the increased business. With these faults in view, the president, at the last annual meeting of the stockholders, held in the early part of November, 1897, secured the passage of a resolution authorizing the board of directors to reconstruct, rebuild and modernize the more than 50 miles of conduit and cable system owned by the company. This work has been begun, and conduit repairing and the hauling in of large quantities of well insulated cable is going on daily.

What is known as the Lynch-Lake four-way glazed terra-cotta pipe is used, and also the Camp glazed terra-cotta single duct, both with round holes three inches in diameter. This is laid at a depth of 30 inches from the top of the top duct to the surface of the street, on a base of four inches of Portland cement concrete, with one inch of the same material laid between each layer of conduit, and four inches of concrete is placed on both sides and on top of the last layer before the trench is filled. All conduit is laid with broken joints, and where each length of duct joins, a strip of cotton cloth is laid directly over the seam, and that is plastered over with Portland cement mortar before any concrete is put upon it. Before another length is laid, a mandrel is used to make perfectly clean the inside of the joints, thus insuring a clear and waterproof conduit.

Manholes are usually built five feet by five feet square and six feet deep, with six inches of concrete on the bottom; nine-inch walls of good, hard brick laid in Portland cement mortar, and where the conduit pierces the manhole wall, round cornered brick is used. A three-inch iron pipe is built in the walls of the manhole about four inches from the bottom, and at right angles to the conduit. This is used for bracing the winch when necessary to be used. Cast-iron tops are used, made five feet square, with cast-iron covers, two and one-half feet by two feet. All manholes are drained either to the nearest sewer or to the next manhole, and iron back water valves are used.

All cable used has an insulation of $\frac{4}{32}$ of an inch thick of best rubber compound and $\frac{2}{32}$ of an inch lead casing, the whole being covered with a cotton or jute braid saturated in some preserving compound and soapstoned, ends of cable sealed before shipment is made. All cable installed is handled in a most careful manner, with particular attention paid to the making of joints, usually made in manholes.

With the completion of the new station and rebuilding and modernizing the cable system, the company will have a scientific and practical plant second to none in the country. Throughout the new plant the greatest simplicity and durability of design and arrangement has been striven for, combined with a desire to obtain, if possible, the highest and best types of the various mechanical and electrical service to be had, cost being considered secondary to efficiency. All wasteful steam auxiliaries have been discarded as far as possible, and all power which can not be obtained direct from the economical and efficient main units is furnished by electric motors.

The station will be equipped throughout with automatic coal scales, hot and cold water meters, electrical recording apparatus, etc., in order to afford the most complete reports and systematic records from the operating force, thereby enabling the closest supervision to be exercised over the cost of production and distribution, and requiring the highest intelligence and efficiency from the employés.

The building committee consists of the president, Mr. A. A. Thomas, and Messrs. Seymour W. Tulloch, James L. Norris and John Cammack.

II—HOW TO BECOME AN ELECTRICAL ENGINEER.*

BY "MORRIS HENRY."

The science of electrical engineering, like that of almost any other technical profession, can not be defined by fixed boundaries, for probably in no other branch of engineering will there be found so many by-paths opening up almost limitless fields of knowledge and research. Each one of these subdivisions could be followed indefinitely, so broad are the possibilities, and so intricate the relationship of electricity to all other departments of physics, but this fascinating pursuit of the theoretical is only possible to those of considerable means and abundant leisure.

We think that the following paragraph, quoted from the catalogue of the Massachusetts Institute of Technology, very aptly defines the qualifications of an electrical engineer:

In most large work in electrical engineering, the questions involved are not merely electrical in their nature, and oftentimes they are not chiefly so. The decision as to whether the erection of a plant under given circumstances is financially advisable, or as to which is the best of several possible modes of procedure, is generally an economic one, and involves a knowledge of structures and machinery quite as much as of electrical details; and in most branches of electrical engineering, the design and handling of machines, of one or another kind, is a constant necessity.

It is well to recognize the principle so forcibly stated by Lord Kelvin, that electrical engineers "must before all be engineers; they must be engineers and they must learn electricity."

* * * *

It has been felt that no electrical engineer can be considered as properly educated without a good knowledge of mathematics and its applications to electrical subjects. Especially is this important in the development of alternating-current machinery and the investigation of the unrevealed possibilities of electric oscillations. And it is probable that in the future there will be a much greater call than in the past for the use of more advanced analytical methods in connection with problems of electrical engineering. On the other hand, it is recognized that one may be a competent engineer without any very exceptional mathematical ability.

* * * *

It may be gathered from the above outline that no road of rose-leaves opens before the student ambitious for the degree of "E. E." This fact, instead of discouraging the earnest candidate, should only spur him up to increased effort and determination. No worthy object in life will be obtained without effort, and generally an effort which partakes of a struggle enforced by indomitable courage and a grim resolution to reach the goal.

The parent of the young man, or rather the young man himself who is trying to choose a calling in life, should most seriously, and without flinching, submit to a searching introspection; a rigid cross-examination, seeking the truth of one's own capabilities.

More heart-breaking failures, more crushed ambitions, more blasted hopes can be attributed to a *mistaken* calling than to lack of ability.

Many a man is attempting to practice medicine, and making a failure of it, who would have made a most successful farmer. Thousands of lawyers are eking out a bare existence who could have earned a competency as merchants. Thousands of shopkeepers could earn more money and would enjoy more privileges and more freedom if they were clerking for some one more capable of assuming the responsibilities of business.

Thousands of jacks-of-all-trades, who are failures, would have made good blacksmiths, and have been a credit to the community in which they live, if they *would*.

Many a man has gone through the world seeking a "soft snap," only to discover, when too late, that it was "fool's gold."

"boss" has landed thousands of misguided men in the poorhouse.

We have not intended to present a gloomy side of affairs, but to show how very, very essential it is that one should *know himself*.

Take up that profession, or occupation, for which you are best fitted, and *stick to it*. Let no false ambition or biased advice misguide you into a channel for which you have not the least ability.

Parents are very frequently to blame for a lack of discrimination as to the future of their sons. No matter how successful a parent has been in his chosen calling, it is unkind and a little short of cruelty to insist that his son should follow in his foot-steps, unless the son has a natural inclination and ability in that direction. It may be that he takes after his grandfather, who was a carpenter, instead of after you, who are a banker. If so, let him be a carpenter, and see that he has every possible advantage of making a good one. He may become a great contractor with many times the amount of capital that you have.

Many a young man is clerking behind the counter of a dry goods store, measuring off pink ribbon by the yard, simply because it gives him the opportunity of wearing clean clothes and making the appearance of a dude, who might be better and more profitably employed in laying brick at so much a thousand.

The determination to be one's own

But we will assume that these matters have been carefully weighed, and that it is the wish for you to become an electrical engineer. So let us see what is the best course for you to pursue.

In the first place, we suppose that you have had an ordinary common school education. If you have had better, you are fortunate.

In the next place, we would advise, if it is possible to do so, for you to attend some college that gives a thorough course in electrical and steam engineering; if practicable, take both courses. We can not advise you which college to attend, but we append a list of the schools and colleges that have a full or partial electrical engineering course, and a letter of inquiry addressed to any one of them will bring catalogues, circulars and particulars as to the specific branches taught, the expenses of tuition and the cost of living in the immediate vicinity of the school. If you can find a good school near your own home, select that one, rather than go to some distant point, other conditions being equal.

Having determined upon the school which you will attend, make up your mind that it is to be a period of close application and hard study. Be thoroughly honest with yourself. If, after a few months, you find you were mistaken in the estimate of your inclination and ability in this direction, do not be afraid to stop. Your instructor will be able to advise you, and if you ask him sincerely, he will tell you frankly whether you should go ahead or not.

On the other hand, do not be discouraged at difficulties; if your heart is in the work, you can conquer the present difficulty, and make each victory a stepping-stone to a greater one.

Be honest and manly with your fellow students. Do not despise that boy who may not be so fortunate as you, and who is working his way through college, and perhaps must wear a neat patch on his elbow.

Diamonds are mostly found in clay. It is the heart and mind which denominates a true gentleman, not broadcloth nor fustian.

Be determined to live within your allowance; do not borrow money or get in debt to tradesmen.

Observation of these principles will do much to sustain dignity and independence of character. Neglect of them may ruin your chances for success.

Almost, if not quite, as great a problem confronts you after your college course is finished as when you started.

How best to utilize the knowledge you have obtained. Although well versed with the technical side of your work, and possessing an intimate acquaintance with the college plant and shops, you will find that, somehow,

* Second Prize Contribution. See ELECTRICAL REVIEW, December 8, 1897, page 276.

LIST OF COLLEGES GIVING ELECTRICAL ENGINEERING COURSES.

This list is compiled from the latest available catalogues published by the various colleges. We also give the name, where possible, of the professor in charge of the electrical or physical work.

Name of School.	Professor E. E. or Physics.	Town and State.
Alabama Polytechnic Institute	A. F. McKissick	Auburn, Ala.
Arkansas Industrial University	W. N. Gladson	Fayetteville, Ark.
University of Arizona	S. M. Woodward	Tucson, Ariz.
University of California	Frederick Slate	Berkeley, Cal.
Throop Polytechnic Institute	Lucien H. Gilmore	Pasadena, Cal.
Leland Stanford, Jr., University	Elmer E. Farmer. Mail. Palo Alto, Cal.	Stanford Univ., Cal.
University of Colorado	George H. Paine	Boulder, Colo.
State School of Mines	Louis C. Hill	Golden, Colo.
Wesleyan University	Edward B. Rosa	Middletown, Ct.
Sheffield Scientific School	Chas S. Hastings	New Haven, Ct.,
Columbian University	Frank Wolff	Washington, D. C.
Florida State Agricultural College	J. P. Davis	Lake City, Fla.
University of Georgia		Athens, Ga.
Georgia School of Technology	R. W. Quick	Atlanta, Ga
Highland Park Normal College	F. F. Elicker	Des Moines, Iowa.
Armour Institute of Technology	Wilbur M. Stine	Chicago, Ill.
University of Illinois	William Esty	Urbana, Ill.
De Pauw University	James P. Naylor	Greencastle, Ind.
Purdue University	Wm. E. Goldsborough	La Fayette, Ind.
University of Kansas	Lucien I. Blake	Lawrence, Kas.
State College of Kentucky		Lexington, Ky.
Manual Training High School		Louisville, Ky.
Tulane University of Louisiana	Brown Ayres	New Orleans, La.
Massachusetts Institute of Technology	Chas. R. Cross	Boston, Mass
Williams College	Henry Lefavour	Williamstown, Mass.
Worcester Polytechnic Institute	Harold B. Smith	Worcester, Mass.
United States Naval Academy	N. M. Terry	Annapolis, Md.
Johns Hopkins University	Louis Duncan	Baltimore, Md.
Baltimore Polytechnic Institute	B. H. Branch	Baltimore, Md
Michigan State Agricultural College	Chas. L. Weil	Agricult'l Coll., Mich.
Michigan School of Mines	Edgar Kidwell	Houghton, Mich.
University of Michigan	H. S. Carhart	Ann Arbor, Mich.
Maine State College	J. S. Stevens	Orono, Me
University of Minnesota	Geo. D. Shepardson	Minneapolis, Minn.
University of State of Missouri	H. B. Shaw	Columbia, Mo.
Missouri School of Mines	A. H. Timmerman	Rolla, Mo.
Washington University	Francis E. Nipher	St. Louis, Mo
Polytechnic Institute	Samuel Sheldon	Brooklyn, N. Y.
Pratt Institute	Arthur L. Rice	Brooklyn, N. Y.
Cornell University	Harris J. Ryan	Ithaca, N. Y.
Cooper Institute	Wm. A. Anthony	New York, N. Y.
Hebrew Technical Institute	E. S. Barney	New York, N. Y.
Columbia University	Francis B. Crocker	New York, N. Y.
Memorial School of Technology	Henry B. Bates	Potsdam, N. Y.
Rochester Mechanics' Institute	Alb. L. Arey	Rochester, N. Y.
University of Rochester	Otis H. Robinson	Rochester, N. Y.
Union College	Olin H. Landreth	Schenectady, N. Y.
Syracuse University	Eugene Haanel	Syracuse, N. Y.
Rensselaer Polytechnic Institute	W. LeConte Stevens	Troy, N. Y.
University of Nebraska	Robert B Owens	Lincoln, Neb.
New Hampshire College	Arthur E. Nesbit	Durham, N. H.
Dartmouth College	Chas. F. Emerson	Hanover, N. H.
Stevens Institute of Technology	William E. Geyer	Hoboken, N. J.
Rutgers Scientific School	Ezra F. Scattergood	New Brunswick, N. J.
Case School of Applied Sciences	John W. Langley	Cleveland, Ohio.
Ohio State University	B. F. Thomas	Columbus, Ohio.
Western University of Pennsylvania	Reginald A. Fessenden	Allegheny, Pa.
Lehigh University	J. H. Klinck	So. Bethlehem, Pa.
Spring Garden Institute	C. Walton Swoope	Philadelphia, Pa.
Brown University	Arthur E. Watson	Providence, R. I.
Clauson Agricultural College	S. Tompkins	Clauson College, S. C.
State Agricultural College of Utah	Joseph Jenson	Logan, Utah.
University of Utah	J. Francis Merrill	Salt Lake City, Utah.
Virginia Polytechnic Institute	Samuel R. Pritchard	Blacksburg, Va.
Miller School of Albemarle	P. C. Southall	Miller School, Va.
University of Vermont	Harry A. Storrs	Burlington, Vt
University of Wisconsin	D. C. Jackson	Madison, Wis.
University of Toronto		Toronto, Can.
McGill University	Chas. Carus-Wilson	Montreal, Can.
Queens College and University	D. H. Marshall	Kingston, Ont.
School of Mining	R. C. Harris	Kingston, Ont.

there is a sharp difference between college experience and the perverse, and sometimes ugly, happenings of commercial practice.

There is less of coloring about the methodical, conventional, calculating work of a well equipped school than there is in the snappy, frictional contact with eventful, every-day problems of station duty. There are "men" of different temperaments and habits who must be directed and managed as a harmonious unit. There are pole lines and underground lines, and storms, floods and fires; franchises and municipal governments; accidents and claims; pleased patrons, and patrons that nothing this side of the New Jerusalem will ever please. Elements of personality will be called into service—or the woeful lack of them discovered—by conditions which would never obtain with any amount of college life and study. Tact and diplomacy must go hand in hand with technical and practical knowledge.

Taking everything into consideration, whether you aspire to the position of consulting engineer or electrical architect, or whether you purpose being a station manager, you can get no better training than to don a pair of the bluest overalls you can find and a checked shirt, and *live with the business* for a year or more. You must *know* central station practice and conditions before you can advise or plan for others.

If your taste leads you in the direction of manufacturing electrical machinery, then it will be advisable to secure an apprenticeship with some one of the large manufacturing concerns. If you have ability as a designer or builder, you will have ample opportunity for development in such surroundings.

Wherever you go, go determined to learn; you may get valuable information from the office boy or the coal heaver.

Perhaps the father or boy to whom we are talking finds it impossible to attend a technical college. That is not an insuperable barrier to becoming a successful electrical engineer. Many a youth has had to contend with greater difficulties and won success from more unpromising circumstances.

We would advise you to go to the best central station or railway powerhouse in your vicinity and work for nothing if they will not pay you. Be on time promptly; keep your eyes and ears open for every opportunity to help in the routine duties.

If possible, go to a station in charge of a manager or superintendent who has had a college training.

Be respectful to your superiors and courteous to your associates, and you will find that desired information comes a hundredfold easier.

Every day of this hard, practical experience will be a stone in the foundation of your future work. Do not be afraid to ask questions, and learn the *reason why* of everything you do.

While you are getting this every-day practice, gather all the information you can from books. If you have done no previous reading on the subject, we would suggest that you begin with some elementary treatise. The primary, intermediate and advanced course of lectures by Houston & Kennelly are probably as good as anything published; are inexpensive, and treat the subject matters in a fascinating, lucid manner not common to text books. These three books may be purchased of any electrical journal. We might add that it would be well for you to subscribe for some electrical periodical, in order that you may be informed of current events and progress in the electrical field.

Before you have been many months in this position the opportunity for advancement will come, but let us say that if you find you are not with the right kind of men, fair-minded, honest men, who will treat you as they ought to treat you, make a change as quickly as possible into some other station.

Do not attempt to accomplish too much in one month or six months, or even a year. Mind, this is to be your life work, and life isn't begun or ended in a day. You can aspire to become superintendent of your station, but do not covet that position until you are competent to assume the duties. Take your steps slow enough to take them confidently and with ability.

If you are bright, thoughtful and energetic, the chances for promotion will come quite as rapidly as you are able to accept them.

Be cleanly in your personal habits, keep your machinery and surroundings neat, orderly and methodical. You can not hope to exercise the right influence over, or govern, or to inspire confidence on the part of those under you, unless you set the proper example and earn their respect and confidence.

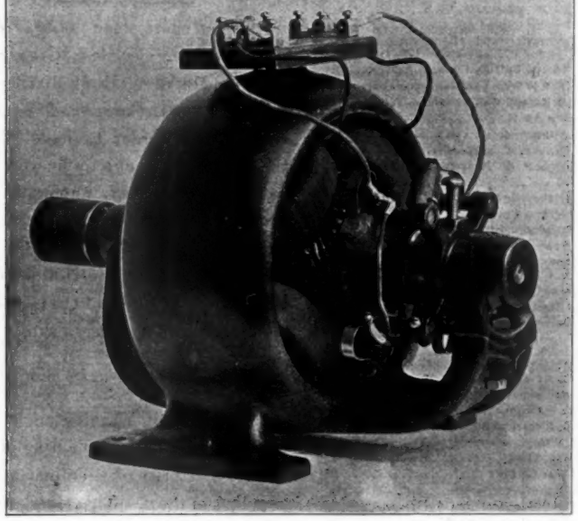
It may be possible after awhile for you to save enough money to enable you to take a two or three-year technical course. In this way you would obtain a finish and symmetry to your education as an electrical engineer, which you could not secure in any other manner.

Do not forget for a moment that your success depends on no one so much as it does upon *you*.

There is no substantial "luck" except the luck of *competency*.

A Student's Electrical Machine.

The illustration herewith shows a new design of dynamo for experimental purposes, manufactured by the Institute for Home Study of Engineering, of Cleveland, Ohio, for its students. It is a high-grade commercial machine, adapted to experimental work; the idea in furnishing such a machine being that, after the student has finished his course, he can use it for ordinary and any work. When the student reaches that part of his course treating of dynamo construction, he receives the machine, with every part finished, and with all the materials for winding; *i. e.*, making the armature complete, putting on and connecting the field coils. This work is a part of the electrical course of the institute. When completed the student uses the machine experimentally during the remainder of his course.



A Student's Electrical Machine.

The illustration shows the machine complete. The armature is of the drum type, with laminated core. The commutator is long, in order that collector rings for taking off currents uncommuted, in from one to four phases, may be slipped on it, together with the new set of brushes required. When operated as an alternating-current machine it excites its own fields.

The range of experimental use is wide. The machines built by the institute have been found to be so well adapted for instruction purposes that they are now in use in a number of schools and colleges. The teachers of electricity find that the practice of winding and collecting the machine is of great value to the students. A full description of the process of winding accompanies the machine when sent to technical schools.

TELEPHONE NEWS AND COMMENT.

The telephone exchange at Baton Rouge, La., has been destroyed by fire at a total loss.

It is expected that an electric light plant, costing in the neighborhood of $7,000, will soon be erected in Downingtown, Pa.

The business men of Bloomington, Neb., are putting in telephones in the principal business places, and in a short time expect to have connection with every town in the county.

The New York & New Jersey Telephone Company is about to erect a $15,000 building in Paterson, N. J., in order to accommodate the local office, which has 1,200 subscribers.

The Mount Whitney telephone line, 150 miles in length, connecting Visalia, Tulare, Porterville and Bakersfield, Cal., has been sold for $2,500 to satisfy a judgment of the Porterville Lumber Company. The telephone company will be reorganized and the line operated.

The Wisconsin Telephone Company has reduced the rate of residence telephones at Ashland from $2.50 to $2 per month, but the rate of business houses will be the same as at present. The company is negotiating with the long distance company to connect Ashland with its system, which runs all through the East.

S. S. House and wife have entered suit against the Cumberland, Tenn., Telephone Company and the corporation of Franklin for $10,000 damages for injuries sustained by Mrs. House on the night of October 20 by stepping into a telephone post-hole that was left uncovered. The injury was a severe sprain and twist of the left ankle. The charges are gross negligence.

At a recent meeting of the Home Telephone Company, of Fort Wayne, Ind., the following officers were elected: President, G. W. Beers; vice-president, C. S. Bash; treasurer, Charles McCulloch. The office, rswith John P. Evans, will constitute the executive committee. There will be no change in the management of the affairs of the company. A number of improvements will be made within the next few months.

The Kurtz National Telephone Company, of the state of Indiana, has been incorporated, with $50,000 capital, and the following officers have been elected: William H. Dry, president; J. V. Mitchell, secretary; John N. Cobb, treasurer; William J. Kurtz, vice-president and manager. This state company has a model plant in operation at Martinsville, Ind., with 220 telephones and four towns connected up by toll lines authorized to do business in every county in the state.

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Special Notice to Advertisers.

CHANGES for advertisements must be in this office by Friday noon for the following week's issue.

NEW ADVERTISEMENTS should be in the office not later than Saturday noon to insure publication the following week.

NEW YORK, DEC. 22, 1897.

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A clever optical illusion, in which electricity plays an important rôle, is illustrated and described on another page. It is said to be very effective on the stage.

We publish in this issue of the ELECTRICAL REVIEW the essay to which was awarded the second prize in our recent contest for the best advice on "How to Become an Electrical Engineer." The essay is accompanied by a table giving a list of the colleges in the United States at which electrical engineering is taught. This list should be preserved for future reference by those interested.

The ELECTRICAL REVIEW extends to each of its subscribers and clients a very merry Christmas and the assurances of its distinguished consideration. We have lots of good things in store for every one, but they are not just ready to be placed in the Christmas stocking. They'll come more in the nature of a New Year's celebration.

The street-car horses are gradually giving up the unequal struggle. Two of them laid down and died in front of their cars in New York streets last week. The carriage and dray horses are also doomed through the advent of the electric carriage. Our children's children will probably find this four-legged animal an interesting stuffed object in the museums of the country.

Another short steam railway contemplates using electric motive power. It is the Morris & Essex division of the Delaware, Lackawanna & Western Railroad. In order to handle both the local and through traffic with dispatch and economy, numerous improvements will be made between South Orange and Newark, N. J., and the officials of the road are considering the adoption of the third-rail system between the places named.

ELECTRIC LIGHTING IN WASHINGTON.

The people of Washington, D. C., are reported to be complaining of the quality and price of illuminating gas supplied to them. The street lighting of the national capital is also claimed to be inferior. There are now in that city two electric lighting companies in healthy competition, either of which it would be supposed could supply electric current for illumination at equitable rates. But the assertion is brought forward that not two per cent of the residences in Washington are lighted by electricity. The chief reason for this is, we are told, that the restrictions surrounding the extension of the subway system in Washington are so severe as to be, in some cases, almost prohibitory. No matter how cheaply current may be generated, it, of course, can not be supplied to the consumer at a low price unless an economical means of distribution is available. The United States Electric Lighting Company, of Washington, will soon have in operation a new and modern generating station, which should produce current at reasonable, and yet profitable, rates. With the opportunity of building or using enough subways for its purpose this company should be able, in the near future, to satisfy the consumer both as to service and rates. The plans and equipment of the company's new station are fully described elsewhere in this issue of the ELECTRICAL REVIEW.

WALL STREET AND THE ELECTRICAL STOCK MARKET.

The stock and bond markets exhibited marked strength in the first three days of the week. On Thursday an advance in call money to 4 per cent served as a check to the investment buying and while this rate is regarded as more or less artificial, the fear of stringent money from now on until after the new year, afforded an excuse for the further depression of values on Friday. One of the most noteworthy developments in bonds was the premium amounting to from 4 to 7½ per cent that was bid by responsible parties for the 3½ per cent bonds and stock of the city of New York.

The New York rapid transit problem again attracted great interest in Wall street. The belief that the Appellate Division of the Supreme Court would, after all, hand down a decision favorable to the underground proposition gained strength as the week wore on and was responsible for the decline in the prices of Manhattan Elevated and Metropolitan Street Railway which culminated on Friday morning, and the announcement Friday afternoon of a favorable decision simply confirmed the earlier reports. It may be pointed out that the court decision need not necessarily be construed as immediately unfavorable to the present transit companies. "There is many a slip 'twixt the cup and the lip" and complications are likely to arise which, together with the friendliness of the incoming administration to the leading interests of both Manhattan and Metropolitan, may yet administer a deathblow to the underground scheme. George Gould in an interview stated that he failed to see why the decision should affect Manhattan interests in the slightest, and it will be remembered that Mr. Whitney, earlier in the week, said that the Metropolitan Company, dependent as it is on short distance traffic, would, at the most, be but slightly interfered with by the underground scheme, which was primarily designed for longer rides.

Two of the Edison Electric Illuminating companies made statements for November. The New York corporation shows an increase in net earnings over the previous year of $8,642. For 11 months the net increase has been $130,645. The Brooklyn company shows an increase in net earnings of $2,471. The interest has increased $2,083, so that the increase in the balance after the dividend is $388. The increase for 11 months is $21,783.

The Bell Telephone Company paid its regular dividend of three per cent and an extra of one and one-half per cent, both payable January 15 to stock of record December 31. The directors at their meeting this week took no action relating to the sale at auction of the 1,500 shares of stock not taken by stockholders.

The Edison Illuminating Company of Brooklyn declared a quarterly dividend of one and one-half per cent, payable January 16 to stock of record December 31.

The Edison Electric Company's

coupons of the first consolidated mortgage gold bonds due January 1 will be paid by the State Trust Company.

Electrical stocks during the week reflected the course of the general market. On the New York Exchange, American Telegraph and Cable, after closing last Saturday at 91½, sold down to 90½ this week and closed around the latter figure. Edison Illuminating of New York advanced 1¾ points to 125; General Electric lost fractionally, closing about the lowest; while Western Union fluctuated within a range of two points. During the week $3,000 Edison Electric Illuminating first consolidated gold 5s sold at 111⅞; $2,000 General Electric debenture gold 5s between 100 and 100¼; $15,000 Western Union collateral trust 5s at 109½–110 and $1,000 debenture 7s at 105. In Boston, Bell Telephone was active at an advance of five points during the week, closing within one-half point of top. Erie Telephone was steady around 71½ and 72; General Electric preferred bid 80 and offered at 85. On the Philadelphia Exchange, Electric Storage Battery stocks were quiet at unchanged quotations. Pennsylvania Heat, Light and Power stocks were fairly active at figures ranging between 18 and 18¾. BAIN.

Wall street, December 18.

ITEMS OF INTEREST.

It is claimed that there are over 1,200 independent telephone exchanges in the United States. The largest, at Detroit, has 6,000 subscribers.

McKinlock & Camp, who have moved to 175 East Randolph street, Chicago, agents of the successors of the Metropolitan Electric Company, are handling the new standard dry battery, which is manufactured by William Roche, a pioneer dry battery maker. It is claimed to be equal to any dry battery on the market, and a sample test, it is said, will verify this statement.

Judging from the interest taken by manufacturers in the electrical and kindred industries, the Electrical Exhibition to be held in Madison Square Garden, New York city, next May, promises to be unusually successful from every standpoint. We understand that the display and arrangement of operative exhibits will be especially attractive both to the engineer and the general public.

Boston's Modified Transit Lease Ratified.

The modified lease of the West End Street Railway Company, of Boston, to the Boston Elevated Railroad was approved on December 18 by the Massachusetts Board of Railroad Commissioners. The objections found in the first lease by the commissioners, the 99-year term with an eight per cent dividend on the common stock of the West End, were modified in the second to a 25-year term and a seven per cent dividend. The actual work of construction will be begun, it is said, as soon as the architectural and detail plans have been submitted and approved by the railroad commissioners.

Warning to Inventors.

As the new amendments to the patent law go into effect on January 1, 1898, it is well that inventors, both here and abroad, says the *Scientific American*, should bear in mind several of the very important changes which may seriously affect their rights.

1. Under the new law a patent can not be obtained for any invention which has been patented or described in any printed publication in this or any other country more than two years prior to the application.

2. No patent shall be refused nor shall any patent be declared invalid by reason of its first having been patented in a foreign country, unless the said application was filed more than seven months prior to the application in this country.

3. The application must be completed and prepared for examination within one year after the filing of said application. In default thereof it shall be regarded as abandoned.

4. An interference will not be declared between an original application and a patent issued more than two years prior to the date of filing the said application.

In view of these changes in our patent practice it is desirable that those who are interested, and who will be affected by the laws as above mentioned, should file their United States applications before January 1.

We have a number of times called attention to these impending changes, but they are of such great importance, particularly those mentioned in paragraphs 1 and 2, that we take this occasion to again call attention to these points.

It should at the same time be borne in mind that the term of the United States patent will not be shortened by the prior filing or issuing of a foreign patent for the same invention. It is possible, therefore, for the American inventor now to proceed with foreign applications without waiting for his United States patent to be issued.

PERSONAL.

Mr. George H. Usher has been promoted from the position of assistant superintendent of the Postal-Telegraph Cable Company to the position of superintendent. This promotion is one in every way creditable to the company. Mr. Usher is the right man for such responsibilities.

When a man has held for a great many years a position of trust, requiring special training and experience in his particular line, it goes without saying that such a man must necessarily become more and more valuable to his employer as each succeeding year is added to the past. To put aside such a valued employé to make room for some political favorite would seem, to say the least, very unbusiness-like, but it happens only too often in municipal and other institutions. It is with much pleasure and satisfaction that we note the recall of Mr. C. C. Haskins to his former position in the city electric inspection department of Chicago on the first instant, and can not refrain from complimenting his superior officer on so soon rectifying the mistake of several months ago.

LATE NEWS.

The Citizens' Railway Company, of Fort Scott, Mo., with a capital of $60,000, has been incorporated, to operate an electric railway system at Fort Scott and furnish electric light and power. The directors named are W. B. Hurst, W. H. Frost, H. C. Post, C. B. McDonald, W. D. Lowry, D. P. Thomas, Grant Homaday, W. C. Perry and John H. Crain.

It is understood that an agreement about to be made between the Metropolitan Street Railway and Third Avenue Railroad Companies, of New York city, provides for a system of transfers at nearly all of the junction points of the two lines, and that it will go into operation as soon as the differences between the two companies have been fully adjusted.

Mr. G. Byron Chandler, vice-president of the Manchester, N. H., Electric Company, has issued invitations for an inspection of the company's station at West Brook and Canal streets, on Wednesday, December 22, at two o'clock P. M. A luncheon will be served at half-past two. The company has recently completed extensive enlargements and improvements of its plant.

Surveyor Lemon has recommended that the Government Building of Cincinnati, Ohio, be provided with an electric light plant, to cost from $35,000 to $40,000, for the purpose of properly illuminating that building, where, under the present system, night darkness reigns most of the daytime. Senator Foraker will ask Congress for an appropriation for the purpose.

Deputy Sheriff Williams, of New York city, last week received an attachment against the Electrical Advertising and Sign Company for $750, in favor of Theodore F. Wood as trustee of the United States Express Company, for rent of part of the roof of 1313 and 1315 Broadway, corner of Thirty-fourth street. The Sheriff levied upon the sign on the roof, but is in a quandary what to do with it.

The business of the Electric Carriage and Wagon Company, of which Isaac L. Rice was president, and which has been operating 14 electric cabs in New York city since January 1, has been taken over by the Electric Vehicle Company. The new company will place in service 50 new electric hansoms and 50 electric coupés. It is expected that the new carriages will be in operation early in the Spring. The premises, 1680–84 Broadway, have been leased for the company's principal station.

The New York City Gas Commission decided last week to double the number of arc lamps on Fifth avenue from Washington Arch to fifty-ninth street. The lamps, which are two on a pole, are now placed alternately on one side of the street and the other. A new pole bearing twin lamps will be erected directly opposite each of the old ones. The commission also decided to light Park avenue under the elevated structure of the New York Central Railroad from 110th street to the Harlem River with 32 arc and 126 incandescent electric lamps.

THE ROENTGEN-RAY WAVE LENGTH DEPENDS UPON THE POTENTIAL.

BY WILLIAM ROLLINS.

When we try to see what goes on in a vacuum tube, looking at it "with that inward eye which is the bliss of solitude," the Roentgen rays appear to differ only in degree and to be dependent for their penetrating power upon the potential of the current and the degree of the vacuum in which the cathode discharge takes place. We should bear these probabilities in mind in the practical application of the rays to medical diagnosis, arranging the potential so as to make rays of the proper length for our purpose. If we wish to see the outlines of the bones of the hand distinctly we shall keep the potential low, to make the contrast with the soft tissues great, while if the bones are more deeply seated we should not use a tube with a higher vacuum to send the rays through a greater thickness of tissue, but we should keep the potential and vacuum the same to prevent altering the wave length, and increase the light by making more impacts upon the target from the cathode discharge.

Suppose we take a tube with the lowest vacuum in which we can generate any considerable number of Roentgen rays. In this tube the anode must be cooled and the cathode movable. The tube should have a potash bulb, as used by Crookes, to quickly lower the vacuum or raise it again. The curvature of the concave cathode is to be that of a sphere of two inches in diameter. A spherical curvature is not the best; but, as Kipling says, "that is another story." With a very low vacuum we can generate Roentgen rays with the anode nearly in the center of curvature, or a little over one inch from the cathode, and yet have good definition if we have taken care in grinding the concave surface. Then, if we look through a hand, the bones seem very dark, because of the contrast with the softer tissues. If, now, with the same potential, we increase the number of impacts upon the anode target from the cathode discharge, we make both bones and soft tissues lighter without much changing the relative values. If we raise the potential and the vacuum, focussing the cathode stream on the target again, we shall find, as previously stated in these notes, that the distance between the cathode and anode is increased, while the bones are, relatively, more transparent. Every time we do this with higher potentials and vacuums, the relative opacities of two substances are changed; and we could go on building more powerful apparatus until we could make rays to which all the so-called elements would be as transparent as glass to light. Platinum being then permeable, we could, for some of our work, abandon internal cooled reflecting anodes and use a form of tube employed in some of my experiments, the platinum, in the form of a disk, being sealed into the wall of the tube, corresponding somewhat to Lenard's aluminum window. Then, by using higher potentials and cooling both terminals, we could approximate to that vibration to which the worlds are transparent.

The Willard Storage Battery Company Changes Hands.

The Willard Electric and Battery Company, of Cleveland, Ohio, have been absorbed by Sipe & Sigler, and the manufacture of the Willard storage battery will be henceforward conducted on an extensive scale.

The firm of Sipe & Sigler have long been known as leading manufacturers and wholesalers of jewelry in Cleveland. They are also the manufacturers of the well known American filled watch-case and Cleveland watch chains, and they are the sole owners of both the American Filled Case Company and the Cleveland Chain Company, both of which enterprises they now abandon to give their full financial weight and personal attention to the manufacture and sale of the Willard battery.

Though both are still young men, yet they have forged to the front ranks of Cleveland business men and are well known for their business acumen and enterprise. In the deal that has just been consummated, Mr. Theodore A. Willard, the inventor of the battery which bears his name, and H. M. Hawley have become members of the firm of Sipe & Sigler, and the business will hereafter be conducted under the firm name of Sipe & Sigler.

This deal was brought about, it is said, by popular demands for the Willard storage battery which far exceeded the capacity of the Willard Electric and Battery Company to supply. In fact they were obliged to turn away monthly many thousands of dollars worth of orders owing to their lack of factory capacity and finance to execute them.

They were thus compelled to look about to invest more capital in the enterprise, and the factory being for nearly two years past located in the power building of Sipe & Sigler, it is but natural that they should have been approached first.

The manufacture and sale of the batteries will be conducted in the Sipe & Sigler power building, which is one of the finest and most perfectly appointed to be found anywhere. It contains six stories and a basement, and each floor is 35 feet by 165 feet in size. The entire building will be devoted to the manufacture of the Willard storage batteries of all types and sizes, each one adapted to its own particular use.

The basement will contain the power plant and the system of generators; also a storage battery for the lighting of the building and for the economic supplying of power. The different floors are being equipped with the finest special machinery, and preparations are being made throughout to run the plant continuously the full 24 hours and to manufacture storage batteries on a large scale.

The first floor will be devoted to the electro-chemical process known as forming; the second to the offices, laboratory, drafting and engineering departments; the third will be devoted to assembling and other kindred operations; the fourth and fifth will be equipped with special machinery for the manufacture of the plates and other parts, and the sixth will be devoted to the manufacture of the concentric form of Willard battery, which has so suddenly sprung into popular favor, owing to the many advantages of its peculiar and original construction.

The building was designed especially for fine manufacturing purposes by Messrs. Sipe & Sigler, and is perfectly lighted from all sides. It is equipped with the General Fire Extinguisher apparatus, and will comfortably employ 900 operatives.

A New Complete Catalogue of Edison Incandescent Lamps.

This catalogue, recently issued by the General Electric Company, forms what is claimed to be the most complete catalogue of the kind ever produced. It is nothing more or less than a treatise on incandescent lamps from the customer's point of view. The catalogue begins with introductory chapters on the "Production, Selection and Use of Lamps." In these are set forth in a concise, telling manner the methods which have given the Edison lamp its popularity and an account of the importance and value of skill and experience in lamp production, how to select the type of lamp best suited to the purchaser's conditions and the necessary requirements for the proper use of lamps. Descriptions of the various types of lamps follow the introduction and a full-sized illustration accompanies each lamp described. The descriptions and illustrations include every class of lamp manufactured by the General Electric Company, of which there are over 30,000 varieties, including the various voltages and candle-powers, etc., and of which the General Electric Company produce and sell annually over 6,500,000.

Following the description of the lamps is an "Appendix of Information on Incandescent Lamps" of great value to all lamp users. The opening discussion is on the "Life and Candle-Power of Lamps," in which the subject of decline of candle-power and its bearing upon the lamp renewals is clearly set forth. Following this is a chapter on the "Importance of Good Regulation," and additional chapters on the "Method of Measuring Lamp Value by Candle-Power Area," "Special Points to be Remembered in the Use of Lamps," "Faults in Incandescent Lamps," and tables of lamp data.

The concluding chapters of the appendix are given to the subject of "General Illumination" and "Correct Use of Light," "How to Avoid Harmful Effects on the Eyes."

Altogether the catalogue is a very complete and interesting commercial treatise on incandescent lamps. Its typography is excellent and the illustrations of the lamps well designed and executed. It is a valuable and useful book of information and reference. Copies have been sent to all station managers in the United States and can be obtained from the General Electric Company's lamp works, Harrison, N. J., or at the company's nearest local office.

American Institute of Electrical Engineers.

At the 120th meeting of the institute, held at 12 West Thirty-first street, Wednesday, December 15, about 100 members and visitors were in attendance. A paper was presented by Mr. Thorburn Reid, of New York city, on "Sparking, Its Cause and Effects." The discussion was opened by Mr. Gano S. Dunn and was participated in by Messrs. Kennelly, Steinmetz and others.

After the close of the discussion Mr. W. J. Clarke, of New York, gave a very interesting and successful exhibition of the Marconi wireless telegraphy. Signals were audibly transmitted between the extreme ends of the parlor and lecture room, the folding doors being closed between them.

At the meeting of the executive committee in the afternoon two associate members were transferred to full membership.

The meeting of January 26 will be devoted to the question of standardizing generators, motors and transformers. The policy of undertaking this work as well as the technical problems involved may be discussed.

Communications upon the subject are invited and may be sent to the secretary in advance of the meeting.

An Electric Mail Box.

A Swiss electrician has invented an electric mail-delivery box, which is now in use in several of the larger buildings in Geneva, says the London *Electrical Engineer*. The box has a compartment for each of the stories of the building, and when the letters are deposited on the ground floor the carrier delivers them as required. The deposit of a single letter makes an electric contact, which starts a bell going on the respective floor, which does not cease ringing until the letter is taken out. At the same time it opens the faucet of a tank on the roof of the house, which causes water to flow into the cylinder forming the counterweight of the mail-box elevator, until the weight is heavier than the box, when the box ascends, and the flow of water ceases simultaneously. As the box passes each story, the mail intended for it—letters, papers, and small packages — falls into boxes in the corridor on that floor. This is performed very reliably by a little spring at the bottom of each compartment in the elevator mail box, which causes the bottom of the compartment to catch for a moment, and the release throws out even a single piece of paper thinner than a postal card into the stationary box provided for its reception. When the box has passed the uppermost floor, the cylinder filled with water strikes a bolt provided at the bottom, which allows the water to flow out, and by its own weight the box descends to its place on the ground floor. Should by any mischance a single piece of paper have remained in the elevator, upon striking the bottom it will at once go through the same series of movements as before.

National Association of Manufacturers.

The district members of the National Association of Manufacturers of the United States, consisting of Warner Miller, chairman; Augustus G. Paine, treasurer; Charles E. Locke, secretary; Pliny Jewell, Benjamin Atha, Charles A. Schieren and Charles A. Moore, vice-presidents, have been in almost constant session during the past two weeks organizing for the third annual convention of the National Association of Manufacturers, which will be held in New York January 25, 26 and 27. The business sessions will be held in the Masonic Temple, corner of Twenty-third street and Sixth avenue, upon the days of Tuesday, Wednesday and Thursday, January 25, 26 and 27, and upon Thursday evening, January 26. Additional committee rooms for the accommodation of the various sections of the Association have been secured at the Fifth Avenue Hotel, which is nearby the Masonic Temple. The social headquarters will be at the Waldorf-Astoria. The night of Tuesday, January 25, will be devoted to a grand Bohemian smoker, the details of which are in the hands of a committee. The grand banquet will probably be the largest ever given in a hotel, and will also take place at the Waldorf-Astoria on the night of January 27.

It is expected that the most notable names among the public men of the country will appear in the list of speakers. Letters are being constantly received at the convention offices, rooms 80 and 81, Times Building, asking for the reservation of places at the banquet. The committees are all at work, and propose making the coming to Greater New York of the manufacturers of the country an event long to be remembered. It will be the first important gathering in New York after the new charter goes into effect. In capital invested, the value of products and the number of hands employed, the National Association of Manufacturers probably represents a larger aggregate than any other business organization in the world.

It was formed in January, 1895, as the result of a widely existing desire for a strong and well balanced organization, thoroughly national in its character, equipped for the performance of any service which the manufacturers of the United States might require. Upon this basis the association has developed into a powerful organization, embracing in its membership upwards of 1,000 of the largest manufacturers' interests, representing every important industry and every prominent industrial center in the country.

The Lake Erie Electric Light Company and the Wright Gas Company, of Lorain, Ohio, have been consolidated, and the new company will probably be known by the name of the latter company. The capital stock of the consolidated company will be increased to $150,000.

SPARKING, ITS CAUSE AND EFFECTS.*

BY THORBURN REID.

Present theories in regard to the operation of commutation and the nature of sparking, show considerable progress beyond those of a few years ago. The most important step forward was taken when the reactance of the coil under commutation was recognized as the greatest obstacle to perfect commutation, and the duty of overcoming this reactance was assigned to the electromotive force set up by the cutting of the lines from the field by the coil under commutation. It was also recognized that this must be limited by the available reversal electromotive force.

This was a long step forward, but it stopped just short of a complete explanation of the phenomena involved. This failure was due to an erroneous idea, which has fastened itself on the theory from the start, that injurious sparking was due to the current sparking across the gap between the brush and the receding segment, by reason either of incomplete reversal of the current or of over-reversal.

I shall attempt to show in what follows that sparking from either of these causes may be harmless, and that the real injury is done before the segment leaves the brush.

Taking first the simplest case of commutation—that of a coil of n turns with its ends connected to adjacent commutator segments—we may state the operation of perfect commutation thus:

1. Consider a coil which is approaching a brush through which the current is entering the armature from the outside circuit. The brush covers the segment connected to one end of this coil, and half of the brush current is passing through the coil from segment 3 to segment 2 (Fig. 1), the other half from segment 3 to segment 4.

2. Consider this coil receding from the brush, which now covers segment 2, as shown in Fig. 5. Half of the brush current is now passing through the coil from segment 2 to segment 1, the other half passing through the next adjacent coil from segment 2 to segment 3. The current in the coil 3–2 now has the same value under the conditions shown in Fig. 5, as it had before in Fig. 1, but its direction of flow through the coil has been reversed. Between these two positions of the coil with reference to the brush, the whole operation of commutation has taken place, requiring generally but a very small fraction of a second.

Fig. 2 shows the first operation in commutation. The two ends of the coil are now connected through the brush, and the current passing around the left hand circuit of the armature has two possible paths, the one through segment 2, the other through segment 3. The amount of current which will flow from the brush direct to segment 2 depends on the difference of potential between the brush and segment 2, and on the resistance of contact area of segment 2.

Since the difference of potential of any two points in a circuit is the same through whatever path the current flows, this difference of potential is equal to the algebraic sum of the potentials reckoned from the point of contact of the brush with segment 2 to the point of contact of the brush with segment 3, across this contact and through the coil to segment 2. The difference of potential in the commutator segment need not be considered, as it is negligible. The difference of potential in the brush itself is also negligible.

The difference of potential across the area of contact of segment 3 varies directly with the current flowing across it, and inversely with the area of contact. The difference of potential in the coil 3–2 depends on three factors, the CR drop in the coil, the counter electromotive force of self-induction due to change in the value of the current and the electromotive force due to cutting the lines of force of the field. This last we will call "reversal E."

The CR drop varies with the current flowing in the coil. The counter electromotive force or inductance drop varies with the rate of change of the current in the coil. Reversal E varies with the rate of cutting of the field lines.

The CR drop at the contact area and the CR drop in the coil both oppose the current, and the inductance drop aids it as long as the current is decreasing. The reversal E may act in either direction, but is usually opposed to the inductance E. Therefore the difference of potential between the brush and segment 2 equals the CR between the brush and segment 3, plus the CR in the coil 3–2 minus the inductance drop in the coil, plus reversal E. It is seen that, as the brush moves over from the position of Fig. 2 to that of Fig. 3, the area of contact of segment 2 increases, while that of segment 3 decreases. Thus the resistance of the current path from the brush to segment 3 and through the coil to segment 2 is continually increasing, while the resistance from the brush to segment 2 direct is decreasing. Therefore the CR drop across the contact area of segment 3 will increase or decrease according as the contact area of current decreases more rapidly.

Thus, throughout the period of commutation there is an increasing opposition to the passage of the current through the segment 3, and an increasing facility for its passage through segment 2, due merely to the changes of the areas of contact of the brush with the two segments, and to the consequent changes of resistance.

For perfect commutation, which is the case we are considering at present, the impedance of the coil E should always be equal and opposite to the reversal E, as will appear later.

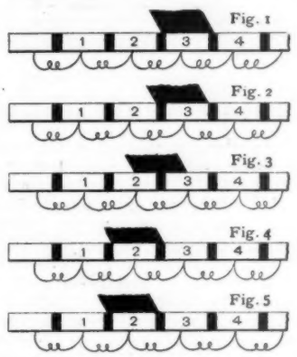
The next period in commutation is that during which the current in the coil is increasing to its final value after having passed through zero.

When the current in the coil is zero, one-half of the brush current is passing through each of the two segments under the brush, on the proper assumption that the current divides equally between the two halves of the armature. The CR drop at the contact surfaces of the two segments will then be inversely proportional to the area of the contact surfaces, and the difference between the impedance E and the reversal E will then, as before, be equal and opposite to the difference between the two CR drops at the contact surfaces. It should be noted here that, although the current in the coil is zero, its rate of change may be considerable, and thus cause considerable inductance E.

While the current in the coil is increasing, the inductance E is in opposition to the current, while the reversal E is in the same direction with the current. Thus, while in the first period of commutation the inductance E prevented the decrease of the current, in this period it prevents its increase. The reversal E, on the other hand, aids the decrease of the current in the first period as well as its increase in the second. The increase of the contact surface of segment 2 and the decrease of that of segment 3 still continue to aid the flow of the current from segment 2 through the coil to segment 3, so that the effect of all these varying electromotive forces is just the same throughout this period as throughout the first period, but the resistance of the coil itself, which in the first period aided the decrease of the current, in this period opposes its increase.

Finally, just as segment 3 leaves the brush (Fig. 4) the current in the coil becomes equal to one-half the brush current and no current passes through from the brush to segment 3, and the segment leaves the brush without any difference of potential between it and the brush.

Now consider how the current should vary during the period of commutation, so that the energy of commutation will be developed equally over every part of the contact surface, and so that the amount of energy developed shall be a minimum.



DIAGRAMS ILLUSTRATING "SPARKING, ITS CAUSE AND EFFECTS."

First consider the variation of the current which will satisfy the first of these conditions. This condition will be fulfilled if the current density in every section remains constant as long as the area of contact is changing; for every part of the segment remains in contact with the brush for the same length of time; that is, the time required for that part to pass from the heel to the toe of the brush. Therefore, since every part is receiving energy at the same rate and for the same length of time, the energy developed in each part is equal. While the whole segment is covered, any change in the current density will affect every section equally, so that the current may vary in any way during that period without causing unequal distribution of energy.

Consider how the current should change so as to develop the least energy. That is, how the current must be distributed between the contact surfaces of the segments so as to develop the least possible amount of energy.

Let R_1 and R_2 be the resistance of the two segments, and C_1 and C_2 the corresponding currents, C being the total current flowing. Then we have for the rate at which energy is being developed at any period,

$$W = C_1^2 . R_1 + (C - C_1)^2 R_2 \quad (1).$$

Differentiating and equating to zero, we have

$$C_1 = \frac{R_2}{R_1 + R_2} C \quad (2).$$

To determine whether this gives a maximum or minimum value, substitute in equation (1) for C_1 the values $C_1 = 0$ and $C_1 = C$, and we get for $C_1 = 0$, $W = C^2 R_2$, and for $C_1 = C$, $W = C^2 R$. Both these values are higher than that obtained by substituting from equation (2) in equation (1), namely:

$$W = \frac{R_1 R_2}{R + R_2} C^2$$

Therefore that value of C_1 makes W a minimum.

This means that for each position of the brush, the energy developed at the contact surface will be a minimum when the current divides between the segments under the brush in the ratio of their areas of contact. It is seen that under these conditions the current density remains constant, and that therefore the requirements of equal distribution of energy are also fulfilled.

Perfect commutation may now be defined as a complete reversal of the current in the coil under commutation, in such a manner that the portions of the current flowing through the two segments to which ends of the coil are connected shall be proportional to the respective contact areas of the segments.

It was shown above that $C_2 R_2 = C_1 R_1 +$ CR drop in the coil, plus the inductance E in the coil, plus the reversal E. If, therefore, the sum of the CR drop of the coil plus its inductance E were always equal and opposite to the reversal E, $C_1 R_1$ would be equal to $C_2 R_2$, which is the condition for perfect commutation, as defined above.

Following are some of the various ways in which imperfect commutation may occur, and the manner in which this imperfect commutation causes injury to the commutator.

1. Suppose that the current flowing across the contact surface of the receding segment does not decrease as rapidly as the contact surface of that segment decreases. The current density then increases and is a maximum at the last part of the segment that touches the brush. More energy is thus concentrated at that point than at any other, and, owing to the fact that time is required to conduct that energy to other parts of the segment, that part will be raised to the highest temperature. This temperature may be high enough to melt, or even volatilize the copper of the segment; therefore, when the brush leaves the segment, the current continues to flow through the film of melted copper, volatilizes it and draws an arc. This arc constitutes the injurious or "vicious" spark. The removal of the volatilized copper from the receding edge gradually wears that edge away. Reduction of the contact surface thus continually increases the current density, and the arc is formed at an earlier stage of the commutation when the current to be broken is greater, and thus the spark increases in viciousness until the commutator has to be turned down before the machine will run at all.

Again the energy developed at the receding edge of the segment may not be sufficient to melt the copper. In this case the current to be broken when the segment leaves the brush will jump across from the brush to the segment. This spark has no deleterious effect, since most of its energy is developed in the space between the segment and the receding brush, instead of being concentrated at the edge of the receding segment. This spark is of the same bluish color as that of the Ruhmkorff coil, by which it may be distinguished from the injurious spark, which is yellow.

2. Suppose that the current flowing across the contact area of the entering segment increases more rapidly than the contact surface increases. The current intensity in that part of the segment then increases, and more energy is concentrated at this point

*Read before the American Institute of Electrical Engineers, New York, December 15, 1897.

than at other parts of the segment, and it will accordingly be raised to a higher temperature. If this temperature is not high enough to melt the copper, no harm results and there is no spark, since the contact is not broken at that point. If, however, the temperature produced is high enough to melt the copper, the melted copper may be carried along by the brush, and the entering edge of the segment is thus gradually eaten away. This will not show by any sparking immediately, but it will eventually cause a spark to appear in the following manner: The eating away of the entering edge of the segment gradually reduces the area of the entering segment and thus increases the resistance of that segment. This delays the decrease of current in the receding segment, and the current density in both segments increases until the temperature gets high enough to produce a spark as described in the first case of imperfect commutation. Another incidental injury that may occur is the deposition of the melted copper at the back of the segment, thus raising the surface of the segment at that point, and this, together with the depression of the surface at the front of the segment, would cause the brush to jump and chatter, which of itself would cause deleterious sparking.

This would explain the cases where a machine runs perfectly sparkless when first set up, but after a time commences to spark, the spark increasing in intensity and deleterious effect and disappearing when the commutator surface has been turned up, only to reappear after sufficient time has elapsed. The wearing away of the front edge of the segment is hardly likely to be noticed, since no injury would be looked for until the spark appeared, and then the cutting of the back edge would be much more prominent because that, being produced by an arc, would have a roughened appearance, while the surface of the front edge would be left smooth by the rubbing off of the melted copper.

3. The reversal E may be large enough not only to reverse the current in the coil under commutation, but even to increase it beyond the value of half the brush current. In this case the extra current would flow through both segment surfaces, but, owing to the fact that this current would be increasing while the receding segment was reducing its contact area, that segment would get hottest, and as soon as it reached the melting point, an arc would be drawn and destructive sparking would ensue.

(To be concluded.)

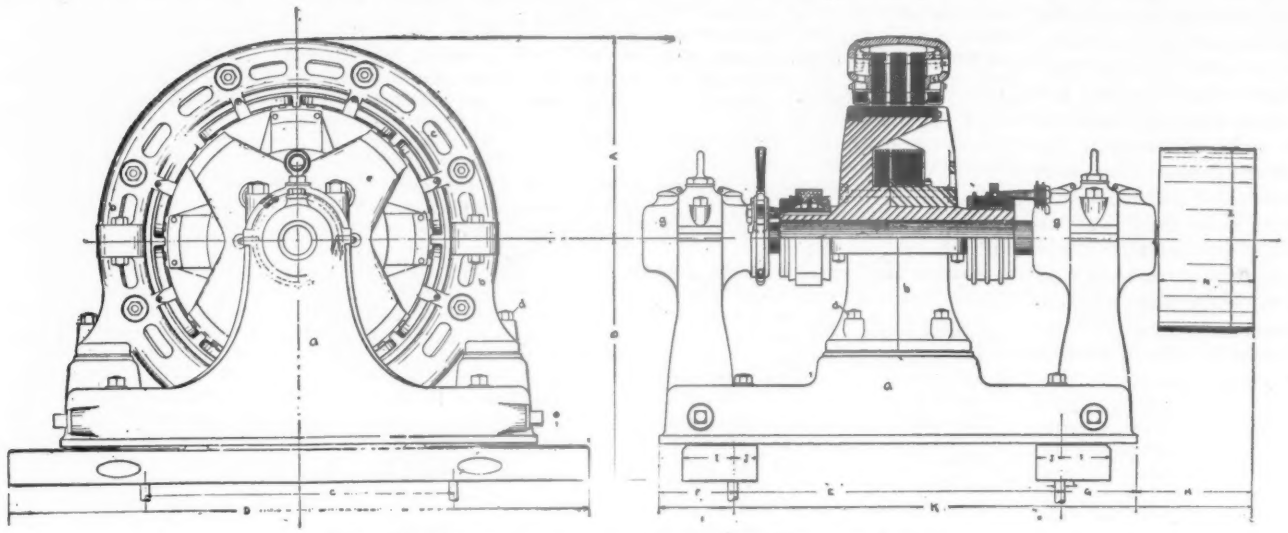


FIG. 1.—WALKER COMPANY'S STANDARD BELTED TYPE ALTERNATOR.

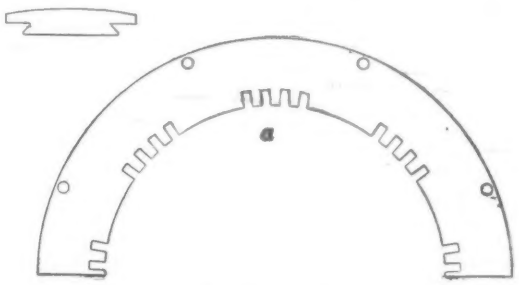


FIG. 2.—ARMATURE LAMINATION, WALKER COMPANY'S ALTERNATOR.

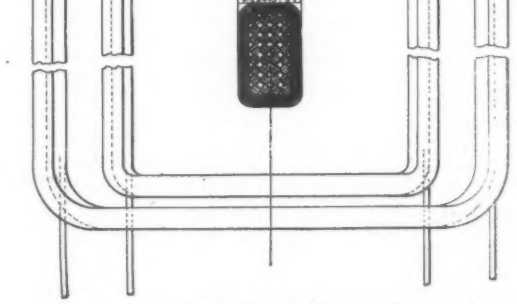


FIG. 3.—ARMATURE COIL FOR WALKER COMPANY'S ALTERNATOR.

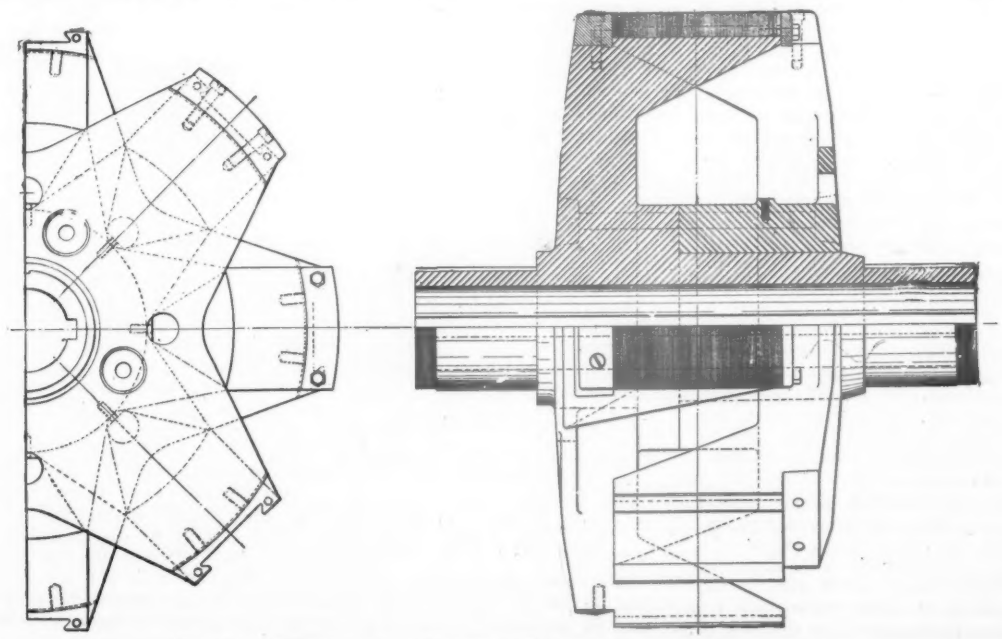


FIG. 4.—A SECTION OF THE INDUCTOR, WALKER COMPANY'S ALTERNATOR.

New Pittsburgh Trolley Line.

It is reported that a new line of railway in Plum and Harrison townships will be built very soon by Pittsburgh capital. It will be known as the Allegheny Connecting Railway, and has been capitalized at $130,000. Robert V. Fulton, of Pittsburgh, is president of the company.

Walker Company's Alternating-Current Apparatus.

The Walker Company has developed during the last three years a complete line of direct-current generators and motors of the most approved type, and its efforts have been rewarded by the adoption of its apparatus by many large electric railways, lighting and power companies from the Atlantic to the Pacific coast. The company has designed and built machines aggregating many thousand horse-power, and ranging in size from the extremely small to among the largest ever built in this class of electrical apparatus.

The performance of the machines which have thus far been furnished by the Walker Company to its customers has been of such a high standard that it has been urged, from all over the world, that the company design and build alternating apparatus for both lighting and power transmission.

The engineers of the company have therefore been engaged for some months in the development of an entirely new type of alternator, which is not only conspicuous for the mechanical construction manifest in all of the Walker apparatus, but also for its high electrical efficiency and extreme simplicity.

The inductor type of machine has been adopted, with a stationary armature, which can be wound and insu-

lated for any required pressure. This, in the case of power transmission, avoids the necessity, in most cases, for using a step-up transformer.

The inductor, which is the only revolving part of the machine, is excited by a field coil, which, in the case of lighting machines, is compound wound, so that the pressure may rise in direct proportion to the increase in the load. The machines are constructed of the best quality of laminated steel and is held firmly in the armature ring frame. The armature coils, which are rectangular in shape and machine wound, are arranged around its inner surface and thoroughly imbedded in slots formed on the inner periphery. The armature core is ventilated by means of air ducts passing radially through its mass, as in the revolving armature of alternate in spacing and have their outer ends bent into line over the center of the hub, leaving an annular space around the hub, where the single field magnet spool is carried, wound with the shaft as its axis. The ends of the inductor spokes are tipped with blocks of thin laminated steel, to avoid heating them by the formation of eddy currents. Two extensions of the hub are provided,

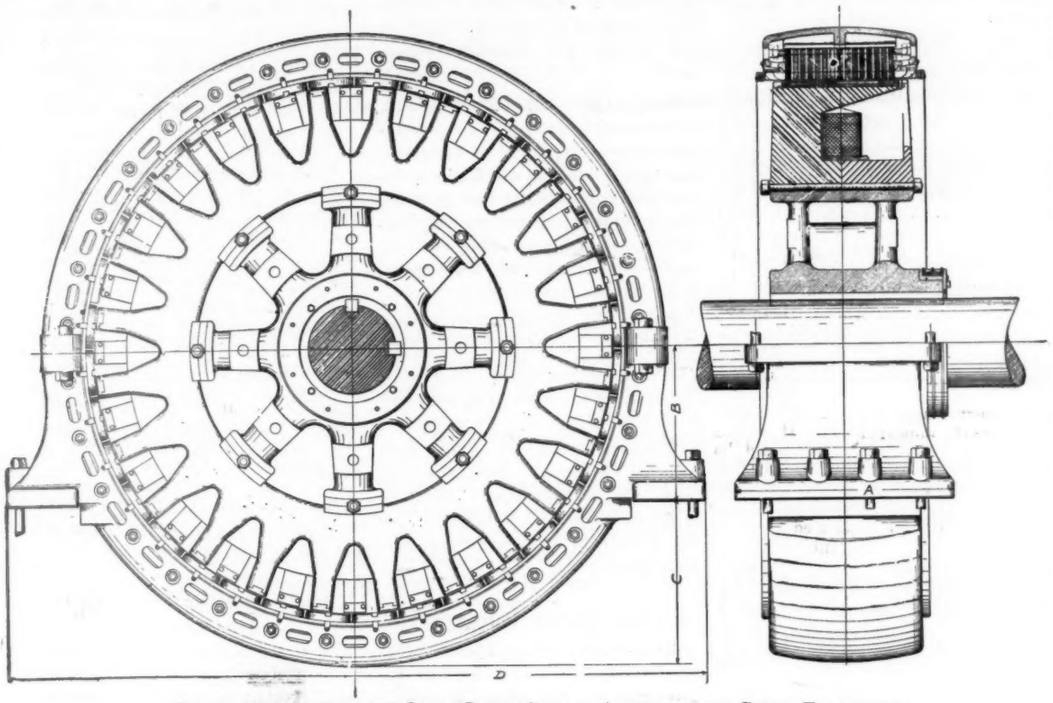


Fig. 5.—Walker Company's Large Direct-Coupled Alternator for Power Transmission.

separately excited by a small, direct-current dynamo, which is furnished with each generator. The amount of current necessary to excite these machines is extremely small. The company has adopted 60 cycles per second as its standard for machines to be used for lighting, and for plants where both lighting and power are furnished. For long-distance power transmission, however, 30 cycles are used.

The generators are wound for single, two or three-phase current, as the exigencies of the work may demand. They are made in sizes and for speeds which long experience has proved most suitable to meet the demands of the trade.

The belted machines which are used mostly for incandescent lighting are of the slow-speed type, and are made in the sizes from 25 kilowatts to 300 kilowatts.

A number of these sizes, both of the belted type and those made for high-speed water-wheels, can be furnished without sub-base, bearing or shaft, so that they may be direct coupled to high-speed engines, for either lighting or power purposes.

Fig. 1 illustrates the standard belted type alternator, having a sub-base *a*, upon which is mounted the stationary armature ring frame *b*. This frame is divided into halves on a horizontal plane, so that the upper half can be removed to inspect and repair the armature bobbins or to remove the inductors.

The armature core, which is made with inwardly projecting teeth, is the direct-current machine. The armature frame is hollow, with large openings to the atmosphere, as shown at *c*, permitting the air freely to circulate through the armature air ducts and around the core iron and armature coils. These ducts, combined with the fanning effect of the rapidly moving arms on the revolving inductor, form a most perfect system of ventilation. The entire armature with its frame can be moved parallel with the axis of the shaft by removing the bolts *d*, which fasten it to the sub-base, thus uncovering the armature coils for inspection or repair, without the necessity of removing the upper half of the armature.

The inductor *e* is carried by the shaft *f*, which is made to rotate in the bearings *g*.

This inductor consists of a hub made of steel, with radiating arms or spokes at either end, which spokes one outside of the inductor arms at either end. Upon one extension is carried a pair of collector rings *h*, which carry the current from the exciter to the field magnet coil, which rotates with the inductor.

When the alternator is to be over-compounded for incandescent lighting, the commutator *i* is placed on the other extension of the inductor hub, having in its periphery as many bars as there are spokes on the inductor. The alternate bars are connected together, and then to the ends of the series winding of the field magnet. A portion of the armature current is thereby rectified, and as its quantity increases the magnetization of the inductor increases, producing the requisite over-compounding. Carbon brushes are used on both the collector rings and commutator in all cases.

Fig. 2, *a*, illustrates one of the armature laminations, showing the internal slotting for single phase. For two-phase winding the unslotted portion would be punched out, making the teeth uniform in width throughout; *b* illustrates one of the punchings used in building up the inductor arm tips.

Fig. 3 represents an armature coil, which is rectangular in shape, is wound on a form in a lathe, and then thoroughly saturated with armature varnish and baked. After baking it is completely incased in a combination of mica and paper insulation and, finally, taped with oiled linen. These coils will easily stand 10,000 volts constant pressure, there being practically no limit, it is claimed, to the insulation which can be procured in this method of armature winding, which is made possible by the design of the machines.

Fig. 4 illustrates a section of the inductor, showing the inductor arms with the laminated tips.

Fig. 5 illustrates a large direct-coupled alternator intended for power transmission. It runs 80 revolutions per minute, has 48 inductor arms and has a capacity of 800 kilowatts and 30 cycles per second.

This machine is designed especially for long-distance transmission of power for railway work, and is wound so as to be connected for either 5,000 or 10,000 volts. No step-up static transformers are used in connection with this machine, but the current is fed directly from it to the transmission lines. Sub-stations along a railway line are provided with step-down static transformers. The pressure is reduced approximately to 500 volts and delivered to rotary transformers, which are six-pole, direct-current machines running at 600 revolutions per minute. These machines are provided with a regular commutator on one side and collector rings on the other side, as shown in Fig. 6. These rotary transformers are furnished in any size from 25 kilowatts upwards. These machines are all 30 cycle, but as there is considerable demand for a 60-cycle rotary transformer, the company expects to be able soon to furnish machines of this character.

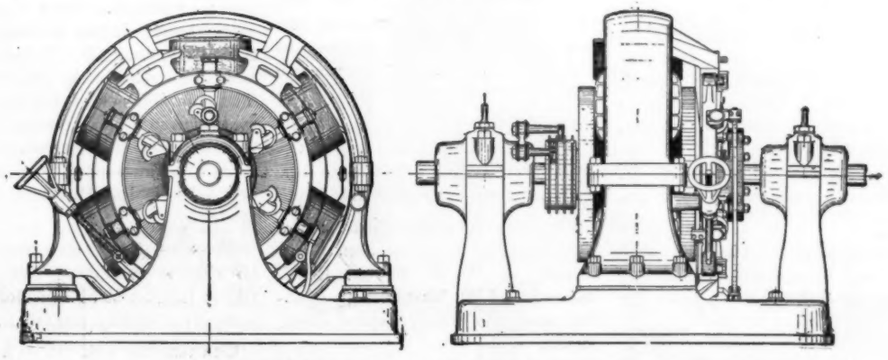


Fig. 6.—Walker Company's Rotary Transformer.

Indianapolis Street Railway Earnings.

It is stated that the Citizen's Street Railway, of Indianapolis, by the close of the present fiscal year to December 31, will have earned all of its fixed charges, including taxes and something on the stock. Earnings since July 1 have been showing very satisfactory increase in both gross and net. The company earned $850,215 gross, and $383,246 net in 1894, against $812,111 gross and $251,226 net in 1893. The present interest charges on bonded debt are about $210,000.

ADVANCE INFORMATION

Electric Light and Power.

WINCHESTER, TENN.—An electric light plant is to be established at this place.

ONEIDA, N. Y.—The new electric light plant at this place is completed and in working order.

MIDLAND, MICH. — The Electric Light and Power Company is contemplating putting in another dynamo for incandescent lights.

BALLSTON SPA, N. Y.—The Ballston Light and Power Company has contracted for a new 3,000-light dynamo.

PONTIAC, MICH. — The electric lighting plant at the eastern Michigan asylum is rapidly nearing completion, and will be in operation in buildings and on grounds by January 1.

CARTHAGE, MO.—The Carthage Light Company has been incorporated, with a capital stock of $50,000; incorporated by John Moore, George M. Meyers, John P. Loomis and others.

BLOSSBURG, PA.—The Blossburg Electric Light and Power Company has been incorporated; capital, $15,000; directors, W. H. McCarthy, J. M. Gray, Walter T. Merrick, Blossburg.

MONTGOMERY, PA.—The Montgomery Electric Light and Power Company, Lycoming County, has been incorporated; capital, $7,000; directors, Charles W. Fehr, William Decker, John Meixell, Robert A. Sechler, J. Scutter Shoemaker, D. W. Shollenberg, Montgomery.

FREEPORT, N. Y.—The contract for the electric light for this place has been awarded to the Hyer-Sheehan Electric Motor Company, of Newburgh, N. Y.

ENNIS, TEX.—The Ennis electric light plant has been sold to C. A. Wheeler and others, of Fort Worth; consideration, $20,000.

MONTOURSVILLE, PA.—The Montoursville Electric Light Company has been incorporated; capital, $10,000. E. A. Tennis, Thompsontown; W. J. Burns and W. H. Hassenplug, Philadelphia; B. C. McAllister, Montoursville, and H. M. Van Zandt, Harrisburg, are the directors.

CUMBERLAND, MD. — The City Clerk may be addressed concerning a municipal lighting plant.

CRISFIELD, MD. — The Crisfield ice plant contemplates adding an electric light plant to its plant.

MORRISTOWN, TENN.—Morristown Electric Light Company sold plant to city.

OSCEOLA, NEB.—The Western Electric Company has secured the contract for the equipment of a complete electric light and power plant for this place.

PAULDING, OHIO—The new electric light plant at this place is now in full operation.

WINNIPEG, MAN.—The City Council has ordered plans and specifications for a 200-arc light municipal electric system. It has also decided to call for tenders for the installation of such a plant, combined with a 100-box fire-alarm system.

MECHANICVILLE, N. Y.—The contract for lighting the streets of this place has been awarded to Edward Farrow, of Willow Glenn, for five years.

HYDE PARK, OHIO—The Hyde Park Electric Light and Power Company has filed articles of incorporation with the Secretary of State, with $5,000 capital stock. The company is to furnish light and power for the village, and I. W. Newcomer, C. C. Stickelman, F. C. Werle, W. I. Newcomer and George A. Bauer are the incorporators of the company.

BEEVILLE, BEE COUNTY, TEX.—R. J. Smith, of San Antonio, is in the city working up interest in an electric light plant which he proposes starting here soon.

FERNANDINA, FLA.—The Savannah Electric Supply and Construction Company, of Savannah, Ga., has been awarded contract for erection of electric light plant of 1,000 incandescent and 40 arc lights; price, $8,000.

KEY WEST, FLA.—The Key West Electric Light and Railway Company is preparing to enlarge its lighting plant and rebuild and extend the street railway and change it to electric power.

New Telephone and Telegraph Companies.

SILVER CREEK, N. Y.—The Hanover Telephone Company are extending their line to Nashville, and will have this line of wires in working order about the first of the new year.

TOLEDO, OHIO—A telephone line is now being built connecting New Knoxville, Botkins and Kettlerville.

BLOOMINGTON, ILL. — The telephone line is being extended east from Fairbury, and it will not be long before Forrest and Chatsworth will be connected with Pontiac.

LOUISVILLE, KY.—The firm of H. J. Croker, Sons & Company, at Orlinda, are building a telephone line from that town to Cross Plains, Tenn.

FITZGERALD, GA. — The Bowen Telephone Company has been incorporated by W. R. Bowen, R. V. Bowen and J. D. Mashburn to establish telephone lines; capital stock, $2,000.

ALTHEIMER, ARK.—The Altheimer Long-Distance Telephone Company has been incorporated by J. H. Moon, W. H. Bellamy, N. T. White and Dr. D. C. Wait to operate long-distance telephones in Lonoke, Arkansas, Jefferson, Pulaski and other counties; capital stock, $25,000.

PRESCOTT, ARK.—The Southwest Arkansas Telephone Company has been incorporated by W. C. Wingfield, C. B. Gale and J. F. Abraham, to own and operate a telephone system in Prescott and surrounding counties; capital stock, $5,000.

RALEIGH, N. C.—George H. Glass, manager Raleigh Telephone Exchange, states that $300,000 will be expended in extending lines and connecting with other cities and the long-distance system.

REELSBORO, N. C.—J. M. Reed contemplates constructing a telephone line from Reelsboro to Arapahoe, a distance of 10 miles. He is in the market for telephone equipment.

DELAWARE, OHIO—The Citizens' Telephone Company have almost completed the construction of their system in this city and will begin operation in a few days. A line is under construction to Kilbourne and Centerburg, where connection will be made with Mt. Gilead, Mt. Vernon, Granville and Newark.

CHADWICK, ILL.—J. P. Hanaford, Dr. Wright and Chas. Demmon are building a telephone line to connect this place with Argo, Ideal and Fair Haven.

REYNOLDSVILLE, PA.—The Summerville Telephone Company has been granted permission to erect telephone poles and string wires, for the purpose of doing a general telephone business.

New Electric Railways.

MCKEESPORT, PA.—The Reynoldton Traction Company has been incorporated to build a line three miles long. President, J. W. White, Blair; directors, H. B. Rinehart, John E. Little, James A. Little, Charles Brigge, all of McKeesport. The capital stock is $18,000. The route will be from Camden station, on the Pittsburgh, Virginia & Charleston Railroad, to McKeesport.

MCKEESPORT, PA.—The Port Vue Traction Company—length of road, two miles—has been incorporated. President, Charles Biggs, McKeesport; directors, Peter Leuckert, McKeesport; James A. Little, McKeesport; John W. White, Blair, and John E. Little, McKeesport. The capital stock is $12,000. The route makes a complete circuit over the streets of McKeesport, and connects with the tracks of the McKeesport & Reynoldton Passenger Railway Company.

BUCYRUS, OHIO—The building of an electric road from this city to Galion is again being considered by a company of eastern capitalists.

CHARLESTON, S. C. — Arrangements are reported as being completed in the interest of the electric line between Charleston and Long Island, the Summer resort on the coast.

PARKERSBURG, W. VA. — The Parkersburg City & Suburban Electric Railway Company has been organized by James M. Jackson, W. W. Van Winkle and Hon. J. N. Camden, to build an electric line six and one-half miles long. Capital stock, $300,000.

ST. THOMAS, ONT.—The City Council have decided to submit a by-law to the ratepayers to guarantee the bonds of the street railway to the amount of $50,000, in consideration of the road being converted into an electric system.

New Incorporations:

CINCINNATI, OHIO—The Standard Electric Company has been incorporated, with a capital stock of $20,000.

ST. LOUIS, MO.—Mound City Transfer Railway Company has been incorporated; capital, $2,000; incorporators, George C. Heitzeburg, H. M. Kling, James Quinlan and others.

PASADENA, CAL. — Electric Express and Storage Company has been incorporated. Directors, E. C. Webster, Clarence W. Cluett, J. H. Holmes, C. H. Richardson, Pasadena, and W. L. Warren, Los Angeles. Capital stock, $50,000; stock actually subscribed, $500.

Increase of Capital.

BEDFORD, OHIO — The People's Electric Light Company has increased their capital stock from $1,000 to $10,000.

MACOMB, ILL.—The Macomb Electric Light and Car Company has increased its capital stock to $50,000.

The Electrical Press.

[From the Fourth Estate.]

There are said to be no less than 58 monthly and weekly journals devoted exclusively to the electrical industry. Of these, 15 are published in France and 11 in the United States, while the others are scattered all over the world.

The ELECTRICAL REVIEW, without boasting, remarks that it goes without saying, of course, that the American electrical public is better served journalistically than any other. American journalism, as a whole, is more enterprising and up to date, and these characteristics naturally extend to special fields where technical journals are carried on by men formerly connected with daily newspaper work.

It is safe to say that the files of any two of the older American electrical journals will be found to contain a complete history of the electrical art since its inception.

LITERARY.

The ELECTRICAL REVIEW has received from Mr. T. C. Penington the "Report of the Sixteenth Annual Meeting of the American Street Railway Association, held in Convention Hall, Niagara Falls, October 19–22, 1897." The proceedings are well prepared and well printed, and the volume contains steel engravings of President McCulloch, Mr. William J. Richardson and Secretary Penington.

Northwestern Electrical Association.

The sixth annual convention of the Northwestern Electrical Association will be held at Milwaukee, Wis., beginning on January 19, 1898.

Kindred.... ...Interests

The Gamewell Fire-Alarm Telegraph Company, of New York city, has issued a handsome new catalogue, illustrating and describing its complete system of fire and police telegraph signaling apparatus.

De Veau & Company, 32–34 Frankfort street, New York city, have issued a new edition of their catalogue of telephones and telephone supplies. The catalogue is conveniently arranged in pocket size, and covers every possible demand for telephone apparatus.

The Cherry Electric Company, of 25–27 Third avenue, New York city, have been receiving some large orders from the different electrical companies for their ammeters and voltmeters, which will keep them busy for some time. The meters register from one to 10 volts, and one of their great advantages is simplicity of construction.

The Cleverly Electrical Works, 1018 Chestnut Street, Philadelphia, have sent to the ELECTRICAL REVIEW a beautifully prepared calendar for 1898. The heading is formed by a large photogravure executed in the highest style of the art and showing an old New England mill. Mr. Cleverly is certainly treating his friends in the electrical fraternity with unusual generosity at this holiday time.

The American Electrical Works, Providence, R. I., has sent out, as usual, a unique Christmas novelty advertising its extensive wire and cable business. The novelty this year takes the form of a folded sheet representing a Christmas tree with presents for everybody attached. The whole is inclosed in a little folder about the size of a postal card and is a very effective bit of advertising.

The Bristol Company, Waterbury, Ct., is sending out a new and excellently prepared catalogue, describing Bristol's recording instruments for pressure, temperature and electricity. There are thousands of these instruments in use, and the demand for them is continually growing. The company's new catalogue is printed in colors, giving the record sheets of the instruments in full size, and describing thoroughly a wide variety of recording instruments for every service where it is desired to measure pressure or temperature.

The Jackson & Woodin Manufacturing Company, of Berwick, Pa., are extending their foundry building by an addition which covers practically one-half the ground of the original foundry. The construction of the new portion will be similar to that of the present building, having steel trusses supporting the roof and carrying the trolleys for transporting material over the foundry floor. They have given the contract for furnishing and erecting the steel work to the Berlin Iron Bridge Company, of East Berlin, Ct.

The Sterling Manufacturing Company, of 120 Liberty street, New York city, are placing on the market a very handy pocket battery of two cells, giving four volts. The battery is covered with a hard rubber case, over which there is another covering of soft rubber and an additional safeguard against any spilling of the fluid. The battery can be charged either from a primary battery or by dynamo current. It weighs only two pounds, and has a capacity of three ampere hours. It can be carried in almost any pocket, being five and one-half inches long by three and one-half inches wide.

McLeod, Ward & Co., 27 Thames street, New York, have just issued a new catalogue devoted to electrical specialties. Between its covers are illustrations and descriptions of the Kinsman desk and portable lamps, the Ward orchestra lamp, the Dillon electro-calcium lamp, the safety wire-holder and the Ward spark arrester for arc lamps. This company has built up a fine business in electrical specialties, and is just now greeted with quite a run on its admirable Ward orchestra lamp, which seems to fill a long-felt want. Every one interested should send for a catalogue.

The Highland Electrical Soldering Paste is rapidly pushing itself to the front as a soldering flux to use where careful work is a requisite. Careful comparative tests have shown that without doubt it gives the very best joint that can be made with the least possible amount of solder and without any corrosion whatever. It is now being used almost exclusively by telephone companies, where the foregoing points of merit are particularly valuable. The electric light companies are also coming to realize that it is very important that every joint made on their lines should be a good joint, and are now using the Highland paste very extensively. The Electric Appliance Company, Chicago, are sending out a two ounce box for a very low price, which gives a splendid opportunity to test the paste, and is a supply of paste which will last probably as long as one pound of soldering salt and do far better work.

WANTED, a situation as armature winder, or to take charge of armature shop, by a man having been ten years in the business. Would like to get in street railroad repair shop. Best of references. M. W. G., care ELECTRICAL REVIEW, New York.

HELP WANTED—MALE

Northern Pacific & Alaska Mining, Transportation & Trading Company, owning thirty-five valuable quartz veins, and nearly a thousand acres of placers in richest Alaskan gold fields, will run steamers from Seattle and San Francisco to Snug Harbor, Cook's Inlet (where will be established a great commercial depot) and connect with only feasible rail route to Yukon, Klondike and Copper River Districts. Offers to investors unique proposition. Correspondence with first-class local or traveling salesman desired. Address (with reference) at Equitable Building, New York.

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ENGINEERS, CONTRACTORS.
Successors to White-Crosby Company, and J. G. White & Co.,
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(Mark envelope "Two-Step.")

We are giving this music, which is regular *fifty cent* sheet music, at this exceedingly low rate, for the purpose of advertising and testing the value of the different papers as advertising mediums.

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Passenger Traffic Manager,
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Mention this paper when you write.

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CONNECTORS AND TERMINALS.
Special Connectors for HARD-DRAWN COPPER WIRE, *All Sizes.*
Fused Wire, Fused Links and Strips.
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Our new Screens and Fluoroscopes are absolutely NON-PHOSPHORESCENT, superior to tungstate of calcium and do not deteriorate.

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BUILT FOR CIRCUITS OF ANY FREQUENCY....

Puritan Electric Company,

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Electrical.... Patents.

[Specially reported for this journal by E. S. Duvall, solicitor of patents, Loan and Trust Building, Washington, D. C. Copies of any patent may be secured for 10 cents each.]

ISSUED DECEMBER 14, 1897.

595,293 Electric railway; J. R. Farmer, St. Louis, Mo.—In a closed-conduit electric railway, automatic circuit-closing and current-supplying devices along the road, constructed for operation substantially as explained, and having their action initiated by a source magnet influence carried by the vehicle and magnetic horns, or projections extending from said device in the direction from which the vehicle comes, to receive the initial energy from said vehicle in advance of the arrival of the contact over the said device.

595,294 Railway signal; W. J. Fawcett, Pittsburgh, Pa.

595,324 Fuel engine; C. K. MacFadden, Chicago, Ill.

595,325 Electric meter; W. D. Marks, Philadelphia, Pa.—The combination with a circuit controller, having two relatively movable contacts, periodically adapted to open and close a circuit, of a device co-operating therewith for maintaining regularity and proper duration of contact at the circuit-controller.

595,327 Electric lighter for burners; S. M. Meyer, Brooklyn, N. Y.

595,329 Means for generating electricity from car-wheel axles; M. Moskowitz, Newark, N. J.

595,330 Electric regulator; M. Moskowitz, Newark, N. J.

595,343 Blinds raised or lowered by means of electricity and solar rays; Eugen Roth, Osnabruck, Germany.

595,344 Controlling device for electric motors; F. J. Russell, New York—The method of controlling an electric motor, which consists in transmitting to an electric magnetic controlling device the unweakened current on the mains as successive impulses, and thereby causing said controlling device to actuate mechanism to establish circuit from said mains through the motor armature, for a period corresponding to the aggregate number of said impulses.

595,345 Electrical controlling mechanism; F. J. Russell, New York.

595,364 Space-block for armature cores; A. F. Batchekder, Schenectady, N. Y.—A space-block for armature cores, consisting of an internal support or spider, a circumferential ring mounted on the arms of the spider, and radial arms, consisting of thin strips of metal mounted on said circumferential ring.

595,367 Joint for electric cables; W. W. Brown, Johnstown, Pa.

595,375 Electric signaling apparatus; W. E. Decrow, Boston, Mass.

595,395 Rheostat or electric heater; F. Kraemer, Chicago, Ill.—In an electric rheostat or heater, solid carbon sticks of a high resistance completely imbedded in a plastic material, material composed of barite or its equivalent and silicic acid.

595,398 Electric alarm device; F. Louis, Brooklyn, N. Y.

595,402 Conductor for electrical apparatus; J. Millis, United States Army—In a dynamo-electric machine, having an armature, whose coils are both conductors of the electric current and magnetic in their action, and the field of said machine being composed of coils similar to the armature coils.

595,403 Transformer; W. S. Moody, Lynn, Mass.

595,409 Electric railway motor; E. D. Priest, Schenectady, N. Y.

595,410 Electric motor; E. D. Priest, Schenectady, N. Y.—In an armature, the combination of a body of laminas, a sleeve to which the laminas are secured, a shaft rotating with the sleeve, and an oil-thrower or throwers formed integral with the sleeve.

595,412 Regulating alternating-current dynamo-electric machines; E. W. Rice, Schenectady, N. Y.—The method of regulating an alternating-current dynamo-electric machine, which consists in causing the main current to strengthen the exciting current with an increase of lag, and to weaken it with an increase of lead.

595,413 Braking alternating-current induction motors; E. W. Rice, Schenectady, N. Y.

595,419 Method of and apparatus for converting electric currents; Elihu Thomson, Swampscott, Mass.

595,420 Electric arc light; Elihu Thomson, Swampscott, Mass.—In an arc lamp, a centrally located movable tube for carrying the upper carbon, having an opening in its side permitting of access to and removal of the carbon when broken.

595,444 Illuminating device for keyholes; F. W. Roll, Denver, Colo.

595,446 Prepayment attachment for electric meters; J. Niven, Saginaw, Mich.

595,497 Oil, gas, or like engines; W. Rowbotham, Birmingham, England—In an explosive engine, the combination with a cylinder having a vaporizing chamber, of a non-incandescent electrically heated body and a make-and-break electric igniting device, said electrically heated body and igniting device being included in a circuit common to both.

595,570 Controlling device for electric railways; R. M. Hunter, Philadelphia, Pa.

595,575 Electric signal indicator; N. Mercier, Manchester, England.

595,580 Secondary battery; P. F. Ribbe, Berlin, Germany—In an electrode for secondary batteries, the combination with a wooden frame of two celluloid plates, connected with each other by dissolved celluloid, said plates having openings with upturned edges, active material in said openings, and a lead plate between the celluloid plates.

595,590 Electric railway system; M. J. Wightman, Scranton, Pa.

595,619 Combination attachment plug; P. F. Gates, Pittsburgh, Pa.—A combination plug for electric lamp sockets, consisting of a plug proper, having a detachable reversible contact pin provided with heads of differential sizes.

595,660 Pipe organ; E. M. Skinner, Boston, Mass.

ELECTRIC RAILWAY NOTES.

Judge Grosscup has denied the motion of Charles A. Bates, of New York, for the appointment of a receiver for the General Electric Street Railway.

The Zanesville, Ohio, Street Railway and Electric Company has gone into the hands of William Christie, receiver. The bonded indebtedness is $200,000, and the floating debt $75,000.

The Pennsylvania Railroad Company contemplates converting the power used on all of the branch lines which connect with the main line of the Amboy, N. J., branch of the road from steam to electricity.

New York capitalists have purchased the franchise of the Milford & Dover, Pa., Electric Railway Company, and it is reported that they mean to construct the road through Magnolia, Camden, Dover, Smyrna and thence to Woodland Beach.

Michigan and Indiana capitalists have combined to build and equip electric railroads. The Indiana Traction Company has been incorporated, with L. N. Downs, of Battle Creek, president, and Dr. Allen, treasurer. Electric lines will also be constructed connecting Michigan cities. The syndicate is now reconstructing a road between Indianapolis and Elwood.

ROASTED OYSTERS AT EAST BERLIN.

THE BERLIN IRON BRIDGE COMPANY GIVES ITS ANNUAL ROAST TO 1,500 PEOPLE IN ITS BIG CONNECTICUT WORKS.

A unique and very delightful event was the annual oyster roast given by the Berlin Iron Bridge Company to its employés and invited guests on Wednesday evening of last week. There were probably 1,500 persons present, each of whom attacked the delicious bivalves about six o'clock. They were roasted in long-handled pans over a furnace of coals, and dumped steaming-hot at different points on the long tables in front of the participants. Each one was provided with an oyster opener in the shape of a wedge-pointed piece of steel, and the person who could open oysters the fastest ate the most. It was estimated that the average was about 60 oysters per head!

There was provided in all some 35 barrels of oysters, three bushels to the barrel, and it is said that not an oyster escaped to tell the tale, although the supply seemed inexhaustible when the representative of the ELECTRICAL REVIEW left about 9 P. M. The invited guests included a number of state and city officials of Connecticut, and customers of the company were present from all parts of New England and the Middle States. In the template building a dance was given to the employés by the liberal management of the Berlin Iron Bridge Company, and was enjoyed until a late hour. Refreshments, in addition to oysters, were abundantly and conveniently served, and the occasion was in every way a highly enjoyable one. President Charles M. Jarvis, of the company, was unanimously elected the next Governor of Connecticut by the rejoicing visitors before their departure.

The history of these annual roasts is interesting. Some 19 years ago Mr. John Towne, one of the general agents of the company, was so delighted over the arrival of a son that he prepared a roast for all the employés of the company. This became a habit with other officials. Meanwhile the works became so extensive that about five years ago the company took the matter in hand, and now the annual oyster roast has become one of the features of the company life, and is greatly appreciated by the 500 or more employés and their families, all of whom reside in the vicinity.

The officers of the Berlin Iron Bridge Company, whose immense works are over half a mile long, located at East Berlin, Ct., are as follows: President, Charles M. Jarvis; vice-president, Burr K. Field; secretary, George H. Sage, and treasurer, F. L. Wilcox.

ELECTRIC LIGHT FLASHES.

The earnings for November of the Edison Electric Illuminating Company of New York, including the high-tension systems, were as follows:

	1897.	1896.	Increase.
Gross.....	$347,295 44	$325,529 40	$21,766 04
Net.....	120,568 20	111,925 82	8,642 38
Gross, 11 mths.	$2,205,630 56	$2,001,162 50	$204,468 06
Net, "	977,822 08	847,176 53	130,645 55

The electric light plant at Port Huron, Mich., was destroyed by fire on December 17. The loss will reach $150,000. The business of the City Electric Railway Company was paralyzed, as its motive power was furnished by the electric light plant.

The United Gas and Electric Company, of Dover, N. H., has elected the following directors: Albert Wallace, G. E. Wallace, Rochester; F. E. Richards, Portland, Me.; B. C. Parsons, Boston; G. E. Macomber, Augusta, Me.; H. L. Shepherd, Rockport, Me.; John Kivel, Dover.

The Boston Electric Light Company contemplates the issue of $800,000 bonds; also to increase its capital $500,000 to $2,500,000, for which a special meeting of stockholders was held December 11 to take action; after this the gas commissioners must sanction the increase. The authorized capital is $3,000,000.

TO CONTRACTORS.

Sealed proposals for furnishing the materials and performing the labor required and necessary for the installation of a switchboard in the new power-house at Ward's Island, N. Y., for Manhattan State Hospital, may be sent by mail or delivered in person up to 4.30 P. M. on Monday, the 27th day of December, 1897, to Henry E. Howland, Esq., President of the Board of Managers, No. 1 Madison avenue, New York city, at which time and place the Board will receive and open all proposals.

Drawings and specifications may be consulted and blank forms of proposal obtained at the office of the Board of Managers, No. 1 Madison avenue, New York city, and at the office of I. G. Perry, architect, in the Capitol at Albany, N. Y.

Each bid must be enclosed in an envelope, sealed and addressed to Henry E. Howland, Esq., President of Board of Managers, No. 1 Madison avenue, New York city, and indorsed "Proposal for a Switchboard, Manhattan State Hospital, Ward's Island, N. Y."

HENRY E. HOWLAND,
President Board of Managers.

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REFERENCES: "Electrical Review," New York; Paul Cromlein, Teller Lincoln National Bank, Washington, D. C.; Judge Geo. D. Parker, Berkley, Va.; Second National Bank, Washington, D. C.; E. K. Leech, U. S. Mint, Philadelphia, Pa.; W. F. Newell, Manager and Secretary Water Works, Olympia, Oregon.
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